

What Affects Student Achievement

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Ehara taku toa i te toa takitahi, engari he toa takitini

My strength is not that of a single warrior but that of many

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Abstract

This study aimed to identify student-level variables that influence academic outcomes, and to determine the extent of their influence. In Study 1, final year secondary students ($N = 654$) completed a questionnaire gathering demographic information and measuring possible influencing variables. A number of these variables predicted academic achievement, including demographic, attitudinal, personality, study strategy and intelligence variables. Mathematical intelligence was the strongest predictor of achievement for all three achievement variables used, and was followed by school decile. Openness to experience and critical reasoning intelligence were the next strongest predictors of two achievement variables (proportion of Merit and Excellence credits attained and Level 3 attainment), while the third achievement variable (credits attained) was next best predicted by participant sex and verbal intelligence. Self-regulation skills were more beneficial when used by high intelligence participants. Likewise, critical thinking skills were more beneficial for high intelligence participants, high socio-economic participants and non-Māori participants.

These interactions and the influence of participant openness to experience were further explored in a subsequent study, in which a second group of final year secondary students ($N = 122$) participated in a year-long study. Participants were divided into three groups: one group was taught critical thinking skills; a second group was taught strategies relating to the facets of openness to experience; and the third group was a control group. The control group was taught peer learning skills, which the previous study found did not relate to student achievement. The

results of the interventions did not show a change in either the target variables or in student achievement for any of the three groups.

Study 3 aimed to identify the student-level variables that influence academic outcomes for first year tertiary students and to determine the relative influence of each variable. This longitudinal study involved students at a New Zealand tertiary institution ($N = 62$) who had previously participated in Study 1 during their Year 13 year. Participants completed a questionnaire that collected demographic, attitudinal, personality and study strategy variables. Year 13 achievement and the use of critical thinking skills were the strongest predictors of student achievement.

Chapter 1: Introduction

How well you learn at school has consequences for the rest of your life. People with higher levels of attainment will have higher incomes (Ministry of Education, 2009b), experience less unemployment over their lifetimes (Ministry of Education, 2010b), have better health outcomes (Atkinson & Bastiampillai, 2006) and have higher living standards (Ministry of Social Development, 2006). In addition to these more tangible benefits, research suggests that people with higher levels of education are also happier, and that this persists across their lifetime (Easterlin, 2001). In addition to the large body of research that explores the benefits of higher levels of achievement or, conversely, the consequences of lower levels, there is also a large body of research on the variables which can be used to predict or influence student achievement. The current work is composed of three related studies in the area of student achievement and its influencing variables. Each study represents different aspects of the subject, and each has different aims and objectives. Thus, the relevant research relating specifically to each study is introduced in the chapter pertaining to that study.

As well as the hardships caused to individuals, lower levels of academic attainment result in a cost to society in the form of increased health and welfare spending, unemployment benefits and reduced gross domestic product. One cost-benefit analysis of an academic intervention program designed to raise student achievement reported savings in welfare and prison costs, and savings in the form of increased tax revenue due to increased personal income (Yeh, 2009). After the costs of the intervention programme and increased costs in subsidising tertiary

fees due to increased eligibility for tertiary entry were taken into consideration, benefits exceeded costs by a ratio of 93, or \$93 in benefits for every dollar in cost (Yeh, 2009). In New Zealand, a large amount of education expenditure is likewise targeted to projects and initiatives designed to raise student achievement. The most recent large-scale Government initiative in this area comes in the form of National Standards, which are standards in literacy and numeracy which students in Year 1 – 8 will be measured against. They are designed so that a learner who meets the standards is likely to attain a typical level (Level 2) qualification in their penultimate year of secondary school (Ministry of Education, 2009c).

The first study was conducted in 2008 and aimed to identify variables that influence academic outcomes in the final year of secondary school (Year 13), and to determine the relative influence of each variable. It included a large number of variables previously shown to influence student achievement. A detailed examination of the variables included in the first study can be found in Chapter 2. In New Zealand, students complete a formal secondary school qualification in their final three years of secondary school, which is called the National Certificate of Educational Achievement (NCEA). Students typically complete one level of NCEA in each of their final three years of secondary school, Years 11 – 13. Therefore, Year 11 students would typically be working towards a Level 1 certificate, Year 12 towards a Level 2 certificate, and Year 13 towards a Level 3 certificate. Attainment during these years is important because of the direct impact that it has on life outcomes, with people who have a secondary school qualification experiencing lower unemployment rates (Ministry of Education,

2010b; Statistics New Zealand, 1991 - 2008) and higher incomes than people with no formal qualifications (Ministry of Education, 2010a; Statistics New Zealand, 1997 - 2008). It is also important because formal secondary school qualifications are a prerequisite for many training schemes, entry-level jobs and tertiary institutions.

Study 1 also considered differences in achievement due to interactions between influencing factors as there may be interactions between variables that determine whether a factor positively or negatively influences achievement, or the strength of its influence. For example, one meta-analysis found that critical thinking skills were of much more use in attaining higher levels of student achievement (Purdie & Hattie, 1999), while other studies have suggested that the influence of openness to experience is moderated by critical thinking skills (Chamorro-Premuzic & Furnham, 2009; Furnham, Monsen, & Ahmetoglu, 2009). This illustrates the importance of determining not only the relative influence of each factor, but also interactions between factors.

Previous studies on student achievement have included different kinds of factors, such as student, home, school, teacher and curricula (Hattie, 2009). Many studies have considered a small number of variables, making it difficult to compare the relative influence of these factors on achievement. Multiple variables must be considered if conclusions are to be drawn about the relative influence of these variables. When university entrance is considered a 'gateway' to future higher education, the particular importance of student achievement in the final year of

secondary school becomes apparent. While it is possible in New Zealand to attain university entrance qualifications prior to the final year, only very small numbers of students do so. For example, in 2009 only 324 students attained a university entrance qualification prior to their final year of high school, compared with more than 20,000 students in their final year. Therefore, an understanding of student achievement in the final year of secondary school would enable a more targeted focus on the factors shown to influence it. The second study in the current work explores a smaller group of variables in a targeted intervention programme conducted in the 2009 academic year with a further group of final year secondary students. This programme aimed to increase the target variables in an attempt to influence students' achievement. It also contains a partial replication of Study 1.

The qualifications attained during the final three years of secondary school determine which tertiary options learners will have available to them. Both the level and standard of qualifications determine whether learners will be able to access tertiary education, and at what level. A university entrance standard is required to study at degree level at a tertiary institution. In 2008, 65.9% of final year secondary students had attained a university entrance qualification by the end of that year (New Zealand Qualifications Authority, 2010a). When students' highest qualification in the year they leave school is counted, regardless of their year level, 44.0% of 2008 school leavers attained a university entrance qualification (Ministry of Education, 2009e). This figure is representative of previous school leaver attainment levels, meaning that more than half of school leavers are not eligible for university entry at degree level. This proportion is

affected by the current adult admission policy, in which students are currently able to enter university in New Zealand without university entrance when they reach the age of twenty. However, many institutions have additional requirements for eligibility beyond university entrance for students of all age groups.

As with a secondary qualification, the benefits of successfully completing a tertiary qualification are also self-evident. Tertiary qualification holders are more likely to be in sustained employment, and have an average income 21% higher than those with only secondary qualifications and 95% higher than those with no formal secondary qualifications (Organisation for Economic Co-operation and Development [OECD], 2006). On average, a tertiary qualification halves an individual's expected period of unemployment over their lifetime (OECD, 2009). In addition, increasing labour market demands for tertiary qualified applicants suggests a slowly increasing risk of exclusion for those with only secondary level qualifications.

Students who are eligible for tertiary study must first decide whether to undertake tertiary study and, if so, which tertiary institution to attend. The decision to go into some form of tertiary study may be one of the biggest decisions they will yet have faced. This is unlike secondary school, where New Zealand students do not have a choice about enrolment and attendance up to the legal school-leaving age of 16. It also differs from secondary school because there are higher costs associated with an unsuccessful attempt at tertiary study, both for the individual student and for society as a whole. Unsuccessful academic outcomes will result in

either a failure to attain a tertiary qualification, or attaining a qualification with inferior grades compared with other graduates. New Zealand university fees for domestic students are partially subsidised by the Government, and students often incur additional costs in loans and living expenses during their study. A student is therefore left with few benefits from a failed attempt at tertiary study, in addition to being burdened with the costs of their course fees, course-associated costs, and the indirect cost of lost income if they had entered the workforce as an alternative to tertiary study.

It is widely recognised that many students experience difficulty in their transition from secondary school to tertiary study. These challenges can have huge effects on students' satisfaction with their course of study, their retention rate, and their academic outcomes (Evans, 1999; Hillman, 2005). It should not be assumed that the factors which influence academic success in a secondary setting are necessarily the same as those which influence achievement in a tertiary setting. Thus, the final study in the current work aimed to determine factors that influence subsequent achievement in a tertiary setting, and to explore their relative influences. This was a longitudinal study, and followed a subset of participants from the first study through to their first year of tertiary study. Differences in the factors that influence academic success in secondary school compared with a tertiary setting would have implications for the education and guidance services that should be offered in these settings. This suggests that in addition to considering the attitudes and strategies that impact on secondary success, high

schools may also need to consider the support that students require to make a successful transition to tertiary study.

The following chapter specifically details the student-level variables measured in Study 1, and discusses previous findings relating to each variable. Chapter 3 outlines the method and instrument used for this study. The results of Study 1 are presented in Chapter 4, where each result is reported individually, and then the overall influences on achievement are discussed in further detail. Chapter 5 outlines the theory and principles underlying the construction of the intervention in Study 2, the implementation of the intervention, and the results obtained. These results are then discussed, and the findings of the partial replication are linked back to the findings of Study 1. Chapter 6 describes Study 3, and discusses previous findings about each included variable specifically from a tertiary perspective. The method and results are then described and these findings are linked back to those in Study 1 in order to draw conclusions about the relative influences of variables in the two different academic settings. The final chapter discusses the contribution this thesis makes to our understanding of student achievement and variables which impact on this, and suggests future directions for research in this area.

Chapter 2: Influences on Achievement for Final Year Secondary Students

The primary objective of this study was to predict student achievement in the final year of secondary school (Year 13). The predictor variables included in the study can be categorised into demographic variables, personality variables, attitudes and beliefs, intelligence measures, and variables concerning the use of different study and learning strategies. Many earlier studies consider the effect of only a small number of variables, making it difficult to determine the relative influence of a wider range of variables. The current study includes a wider range of variables, which allows inferences to be made about both the relative value of these variables and interrelationships between variables. It includes only variables which have been shown to relate to achievement in previous studies. These variables have been analysed to determine their value in predicting three measures of Year 13 achievement.

There are a large number of different variables that could have been included in a study such as this. One recent synthesis of meta-analyses considered 138 different potential predictors of achievement (Hattie, 2009). The current study considers only student and family level variables, and does not consider the relative contributions of school and teaching. Even focussing only on this subset of potential predictors, the variables included in the current study are far from an exhaustive list of student and family level variables. Time limitations on access to participants also meant that a smaller subset had to be chosen from the larger pool

of possible predictors. The selected variables also had to be ones that could be accurately measured by participant self-report.

Each of the included variables and the relevant literature explaining its likely effect on achievement is discussed in further detail in subsequent sections of this chapter. Throughout this study, quoted effect sizes have been obtained by subtracting one mean from the other (e.g., Mean Achievement_{male} – Mean Achievement_{female}), and then dividing by the pooled sample standard deviation (see Hattie, 2009, p. 8, for a more detailed explanation). Hattie's (2009, p. 9) standards for categorising effect sizes have been applied, thus effect sizes between .20 and .40 are referred to as small, .40 - .60 are labelled medium, and effect sizes greater than .60 are referred to as large. Pearson's correlation coefficients have been converted to effect sizes so as to make findings comparable whether variables are categorical or continuous.

Many previous studies focus on achievement in a tertiary setting or with primary or middle-school aged students. Many of these studies are cited in the current study. However, there are relatively few studies specifically considering the effect of student-level variables on academic achievement in the final year of secondary school. This is a surprising gap in the literature, given the importance of the final year of schooling on future outcomes, such as the ability to gain entry to a tertiary institution of choice, or entry into many different occupations. In addition to determining which variables influence student achievement in the final year of

secondary education, the current study also aimed to determine the relative effect of the included variables.

The vast majority of previous research on variables impacting on student achievement was conducted in North American, British or European settings. However, senior qualifications systems in these countries differ from New Zealand's major secondary qualification, NCEA. Students in New Zealand gain credits towards their NCEA qualifications during their final three years of secondary school through a mix of internal and external assessments. Internal assessments are conducted across the academic year, thereby allowing students an opportunity to gain both formative and summative feedback on their progress, and to adjust their efforts accordingly. Therefore, the current study aimed to determine whether findings from other academic settings can be generalised to a New Zealand setting. The third objective of this study was to consider interactions between the use of study skills and other variables.

A small number of New Zealand secondary schools offer alternative qualifications, usually in addition to NCEA rather than in its place. These include Cambridge International Examinations and the International Baccalaureate. These schools are not included in the current study. Students typically complete one level of NCEA in each of their final three years of secondary school. In their final year at secondary school, Year 13 students are usually working towards gaining a Level 3 certificate.

Each NCEA subject at each level is broken down into a number of assessments, and each assessment is worth a prescribed number of credits. Assessments are categorised as either Achievement Standards or Unit Standards. For Achievement Standards, students can receive one of four results for each assessment: Not Achieved, Achieved, Merit and Excellence. If students get one of the three passing grades, they are awarded the number of credits that the assessment is worth. Unit Standards are graded as either pass or fail, and a student passing the assessment is awarded the relevant number of credits.

In order to obtain their Level 3 NCEA qualification, students must achieve a total of 80 credits. Sixty of these credits must be at Level 3 or above, and up to 20 credits can be at Level 2. Credits can be gathered over more than one school year, and so some students may take longer than one year to accumulate sufficient credits for a certificate. Most full-time secondary students take either five or six subjects in their final year of school, and several internal and external assessments are available in each subject. For example, there are seven Level 3 Achievement Standards in English, which are worth a total of 24 credits (New Zealand Qualifications Authority, 2006). A student taking six subjects at Level 3 could feasibly attain upward of 100 credits in that year.

Achievement Variables

One measure of student academic achievement is the number of credits that they attain in one school year. This includes both Achievement Standards and Unit

Standards. To be a true measure of academic achievement at the level typically expected in Year 13, only Level 3 credits are included in this study.

A second measure of academic achievement included in this study is the grade that students attained on their Level 3 credits. A higher proportion of Merit and Excellence level credits shows greater academic aptitude than a student attaining the same number of credits at an Achieved level. In order to recognise this higher level of achievement, a certificate endorsement system was implemented in 2008. If a student achieves 50 or more Merit or Excellence credits, they are awarded a Merit certificate endorsement; with 50 or more Excellence credits, an Excellence endorsement is awarded.

Using the raw number of Merit and Excellence credits as a measure of achievement in the current study would produce a certain amount of overlap with the measure of overall credits attained, however, and also fails to take account of the number of credits that a student may have attempted but not achieved. Thus, calculating the percentage of credits attained at a Merit and Excellence level using the absolute number of credits attempted as a denominator gives a better overall measure of aptitude. This measure of achievement does not disadvantage students who may have had taken courses with fewer credits available, but who have attained their credits with relatively higher grades. In contrast, there may be students who attain a large number of credits at an Achieved level, resulting in a floor effect for this achievement variable.

A third measure of academic achievement is whether the student attains a typical level qualification in that year and, if so, whether the qualification has a Merit and Excellence endorsement. Because credits can be accumulated over more than one year, it is possible for a Year 13 student to attain a lower level qualification, or to attain sufficient Merit and Excellence credits at a lower level to earn an endorsement for an existing lower level qualification. In the current study, lower level qualifications are not included as a measure of achievement, and so students achieving a lower level qualification would not be counted as having achieved a typical level qualification.

Given that one of the major aims of many students in their final two years of secondary school is to gain entry to a tertiary institution, it is worth briefly justifying why a formal university entrance qualification was not included as an achievement variable in this study. Two primary considerations informed this decision; one practical and one statistical. To understand these considerations, it is necessary to have an understanding of the requirements students must meet to be awarded University Entrance. A student must attain 42 Level 3 credits, 8 literacy credits at Level 2 or above, and 14 numeracy credits at Level 1 or above to achieve University Entrance. Thus, most students attaining a Level 3 qualification will also attain University Entrance. However, traditionally University Entrance has not granted automatic entrance to limited entry courses such as medicine or dentistry (University of Auckland, 2010). Likewise, 'University Entrance' is fast becoming a misnomer, with the majority of New Zealand universities having recently introducing competitive entry systems that do not count University

Entrance as sufficient to guarantee entry even to general courses. In response to these concerns, the New Zealand Qualifications Authority (2010b) has recently announced a review of university entrance requirements. These ongoing changes make the use of university entrance unsuitable as an achievement variable in the current study. Secondly, given that the current university entrance qualification is binomial, it does not adequately capture the variance in levels of student achievement compared to the other achievement variables previously discussed.

It is expected that high levels of achievement on each of these three variables represents a combination of effort and ability. The number of credits attained is expected to be more closely linked to measures that suggest increases in the level of ongoing effort exerted, while the proportion of Merit and Excellence credits attained, and Level 3 attainment are considered to be more closely linked to ability.

Demographic Variables

There are a large number of demographic variables that can have an effect on student achievement. The variables considered in the current study include one physical attribute (sex), one cultural attribute (ethnicity), and four variables relating to family background and family means (family structure, home language, socio-economic status and student level of employment).

Sex.

A synthesis of 41 meta-analyses on the effect of sex on student achievement found little effect ($d = -0.12$) (Hattie, 2009). This very small effect was in favour of males. Hattie's (2009) synthesis included meta-analyses on the relationship between sex and achievement, attitudes, leadership and behavioural outcomes. Because the current study focuses on student achievement, particular attention was paid to the meta-analyses considering achievement. The results of these were variable, with Hyde's (2005) review of 9 meta-analyses of sex and achievement reporting an effect size of -0.06 in favour of females. As Hattie's (2009) and Hyde's (2005) studies both included participants from a wide range of age groups, it is valuable to specifically consider the relationship between sex and achievement in the age group relevant to this study.

Hedges and Nowell (1995) meta-analysed the results of six large scale studies, which had a combined total of over 150,000 teenage participants. They found small but consistent achievement differences between males and females. Females generally outperformed males in tests of verbal ability and perceptual speed tests, while males performed better in mathematics and social studies tests. Two of the data sets were for final year secondary participants, and had a total of 41,749 participants. Both these studies found a small effect size in favour of males for mathematical achievement ($d = -0.24$ and -0.22), and little effect for verbal ability ($d = 0.05$ and -0.01). Other studies have found no sex difference in verbal ability (Hyde, 1981; Hyde & Linn, 1988) and minimal differences in mathematics

(Friedman, 1989; Frost, Hyde, & Fennema, 1994). An analysis of achievement in particular academic learning areas is beyond the scope of this study.

In New Zealand, however, a recent synthesis of achievement results found that females are attaining typical level NCEA qualifications at a greater rate than males, and that in Year 13 there is a 13 percentage point difference in favour of females attaining a Level 3 qualification (Ministry of Education, 2007a), although this study does not consider the level of endorsement of such qualifications. The study also found that females are more likely to attain University Entrance than males. Year 13 results in 2009 show a similar level of disparity (New Zealand Qualifications Authority, 2010a). A review of achievement across the New Zealand compulsory education sector found higher levels of achievement for females, but concluded that the overall effect was very small (Hattie, 2010). It was hypothesised that this pattern would continue in the current study, and that female participants would have significantly higher levels of achievement than males, but that this effect would not be as strong as that of other variables.

Ethnicity.

While there is a large body of existing literature on the effect of ethnicity on student achievement, much of the research has been carried out in North American or British settings. Thus ethnic differences in achievement usually refer to African American and Hispanic students (Clark, 2002), or Afro-Caribbean students (Sammons, 1995). While these findings originate from countries with a different ethnic composition to New Zealand, there are many similarities with

regard to disparity in achievement between minority and majority ethnicity students (see Nechyba, McEwan, & Older-Aguilar, 1999, for a review). There is also a sufficient body of New Zealand research to draw inferences about the potential effect of ethnicity on student achievement for the current study. New Zealand studies of achievement results have found that Māori and Pasifika students tend to have lower levels of academic achievement than New Zealand European and Asian students. These findings include the results of both national and international tests (Biddulph, Biddulph, & Biddulph, 2003; McNaughton, 2002; Satherley, 2006). There is some evidence that these gaps in attainment widen across a student's schooling (McNaughton, 2002).

The results of the Programme for International Student Achievement (PISA) found small negative effects on achievement for 15 year old Māori students compared with non-Māori students on each of three subtests (Reading: $d = -0.37$, maths: $d = -0.27$, science: $d = -0.40$), and medium effect sizes for Pasifika students (Reading: $d = -0.50$, maths: $d = -0.44$, science: $d = -0.55$) (Ministry of Education, 2004a, 2004b). With regard to secondary qualifications, approximately 20% of Pasifika and Māori students leave school with University Entrance, compared with approximately 50% of New Zealand European students and 65% of Asian students (Ministry of Education, 2009e). Māori students are less likely to gain an NCEA qualification at all three levels than non-Māori students (Wang, Harkess, & Parkin, 2007). There are also ethnic differences in secondary school retention rates, with Māori students being less likely to complete Year 13 than non-Māori students (Moewaka Barnes, 2001).

Some researchers propose that these findings are due to Māori and Pasifika students being disproportionately represented in lower socio-economic communities, and are a result of socio-economic status rather than ethnicity (Chapple, 2000; Marie, Fergusson, & Boden, 2008). Wylie (2001) found that the effects of ethnicity were no longer statistically significant once family variables and socio-economic status had been controlled for. Nash (2004) found an interaction between socio-economic status and ethnicity in the prediction of reading achievement scores. He found that high socio-economic students outperformed low socio-economic students, and that non-Māori students performed better than their Māori peers. However, in high decile schools Māori students actually performed better than their majority ethnicity peers. Therefore, the effect of ethnicity might not explain additional variance when family structure and socio-economic status are included in the analysis.

Family structure.

A number of different family structure and composition variables have been considered in previous literature, including the number and order of siblings, adoption and maternal employment. A synthesis of 13 meta-analyses on the effect of family structure on achievement found little effect ($d = -0.17$) (Hattie, 2009). The studies included in Hattie's (2009) synthesis considered whether the family was nuclear, or the child was being raised by a single parent in response to divorce or the absence of the father. The synthesis also included studies of adopted vs. non-adopted children and only vs. non-only children. The effect size reflects higher academic performance for children raised in nuclear family

structures. There were also academic benefits to being an only child raised by natural rather than adoptive parents. The current study is concerned with the overall structure of the family unit, and whether the student is living in a one or two-parent family. A number of meta-analyses have found that student achievement is higher for those students living in two-parent families (Kunz, 1995; Reifman, Villa, Amans, Rethinam, & Telesca, 2001). A recent review of relevant literature also concluded that children in intact families outperformed children in divorced families (Guidubaldi & Duckworth, 2009). This review concluded that effects were generally small, and may be a result of diminished socio-economic status rather than a direct result of the separation itself (Guidubaldi & Duckworth, 2009).

A number of these studies specifically looked at the effects of divorce on younger children, but one meta-analysis found a larger negative effect on achievement for secondary school-aged students than for primary or pre-school aged children (Amato & Keith, 1993). These studies also did not consider the difference between divorced families in which the children live with a single biological parent, or divorced families in which one or both of the biological parents have new partners.

One meta-analysis examining the effect on student achievement for children from one-parent families compared with two-parent families concluded that student achievement was higher in two-parent families, and rated New Zealand the worst of the eleven countries studied in terms of differential achievement between the

two family types (Pong, Dronkers, & Hampden-Thompson, 2003). A New Zealand study analysing the effect of family structure on student achievement considered both one and two-parent families, and blended and extended family groupings, and found that achievement was highest in children living in two-parent families (Biddulph et al., 2003). However, achievement for children living in one-parent families exceeded that of children living in blended and extended family situations, or with unrelated adults (Biddulph et al., 2003). Other New Zealand studies have found negative effects on achievement for both divorced families and one-parent families (Nechyba et al., 1999; Wylie, Thompson, & Lythe, 1999). It seemed likely that in the current study students in two-parent families would have higher levels of achievement than students living in other types of family units, but that this result might not explain additional variance when socio-economic status was controlled for.

Home language.

There is a growing body of literature indicating that it takes several years for English as an Additional Language (EAL) learners to gain proficiency in the English language and, in particular, in the level of academic English required for successful participation and achievement in a secondary school setting (Collier, 1987, 1989; Collier & Thomas, 1989; Cummins, 1981; Hakuta, Butler, & Witt, 2000). These studies generally demonstrate a gap in student achievement in addition to the gap in language proficiency (Collier, 1987, 1989; Jochems, Snippe, Smid, & Verweij, 1996). A study on the academic proficiency of native and non-native speakers of the language of instruction conducted with undergraduate

students found that being a non-native speaker had a large negative effect on student achievement ($d = -0.68$) (Jochems et al., 1996), despite language proficiency assessments at the time of entry to the university indicating that the non-native speakers were proficient in the language of instruction.

New Zealand findings are similar to international findings, with one longitudinal study finding that EAL learners entering New Zealand at age 5 were still achieving at a lower level than their peers in some areas after five years of schooling (Wylie et al., 1999). A synthesis of some New Zealand measures of achievement found that students who spoke a language other than English at home had lower achievement levels in reading and writing, and slightly lower achievement levels in mathematics (Satherley, 2006). Similar results were anticipated in the current study, and it was predicted that students who speak a language other than English at home would have lower achievement levels than students who speak English at home.

Socio-economic status.

A synthesis of 4 international meta-analyses on the effect of socio-economic status on student achievement found a medium effect size ($d = -0.57$) (Hattie, 2009). This finding has been duplicated in New Zealand studies, with socio-economic status predicting achievement in reading literacy for ten year olds (Nash, 2004), mathematical and reading literacy for fifteen year olds (Caygill, Marshall, & May, 2008a, 2008b) and school leaver level of attainment (Ministry of Education, 2009e).

One meta-analysis which considered the difference in effect size between school level and student level measures of socio-economic status found a greater effect size for school level socio-economic status than for student level measures of socio-economic status (White, 1982). The student-level measure is parental occupation. The school-level measure is school decile, which is a measure of the extent to which a school draws its students from low socio-economic communities. Decile 1 schools have the highest proportion of students from low socio-economic backgrounds, and decile 10 schools have the lowest proportion of students from low socio-economic backgrounds (Ministry of Education, 2009a). Decile is calculated by matching the addresses of enrolled students to the meshblock in which they live. A meshblock is the smallest Census area, and each meshblock contains approximately 50 households. The five indicators included in the calculation of decile are household income, occupation status, household crowding, educational qualifications and government benefits received (Ministry of Education, 2009a). These factors are weighted by the number of students from each meshblock who attend the target school. Schools are then ranked, and divided into ten equal groups, hence the term ‘decile’.

Employment.

The results of studies examining whether student employment affects academic achievement have not been consistent (for a detailed review of in-school employment see Robinson, 1999). One large scale study found no relationship between student achievement and employment (Mortimer, Shanahan, & Ryu, 1993), while another found that student employment was related to higher

academic achievement for white males (D'Amico, 1984). A further study found other ethnic differences and identified detrimental effects on achievement for minority group students working more than 20 hours per week (Oettinger, 1999). Marsh (1991) found an interaction between the purpose of employment and its effect on achievement, with students who worked to pay for school-related expenses experiencing a positive effect on achievement, and those who worked to pay for non-school activities experiencing a negative effect. A longitudinal study considering the long term effects of student employment found a significant negative impact on student achievement (Carr, Wright, & Brody, 1996). Steinberg and Dornbusch (1991) found detrimental effects on student achievement, and found a medium effect size for the relationship between employment and student GPA ($d = -0.52$). Some researchers suggest that inconsistent findings are due to failing to control for moderating variables such as socio-economic status and ethnicity (Maloney, 2004).

This contrasts with a New Zealand study which found that student employment was significantly negatively related to achievement in School Certificate (now Level 1 NCEA) and University Bursary (now Level 3 NCEA) (Maloney, 2004). However, this study found that when other variables were controlled for, the effect of student employment was no longer statistically significant. The current study involves the collection of variables said to moderate the effect of student achievement. It was hypothesised that student employment would be negatively related to student achievement, but that this relationship might not explain

additional variance in achievement after socio-economic status, family structure and student ethnicity were controlled for.

Intelligence

There is a moderate to strong relationship between academic achievement and intelligence (Allik & Realo, 1997; Chamorro-Premuzic, Quiroga, & Colom, 2009; Colom, 2007; Kuncel, Hezlett, & Ones, 2004). One recent meta-analysis found a corrected correlation of .56 between intelligence and student achievement (Strenze, 2007). A meta-analysis of studies using secondary-aged participants found a medium effect size on student achievement ($d = 0.49$) (Poropat, 2009). A number of large scale, longitudinal studies have found strong relationships between childhood cognitive ability and many adult outcomes, including academic, workplace and health outcomes (Deary, Whiteman, Starr, Whalley, & Fox, 2004; Kuncel et al., 2004).

One large scale study found that intelligence was related to 16 years olds' school performance in 25 subject areas, with an overall correlation of .81 (Deary, Strand, Smith, & Fernandes, 2007). While there are multiple ways of interpreting the factorial structure of intelligence, the vast majority of these studies consider intelligence to be a single construct, *g* or general intelligence (Brody, 1997). The measures used in the studies have varied, with some using a single measure of intelligence (Laidra, Pullmann, & Allik, 2007; Naderi, Abdullah, Hamid, & Sharir, 2008), and some using an aggregated measure comprising several subtests

(Chamorro-Premuzic et al., 2009; Deary et al., 2007; Rindermann & Neubauer, 2001).

Some of these tests include measures of the two factors of intelligence hypothesised by Cattell (1971), crystallised and fluid intelligence, while others are composed of more specific measures of intelligence, such as verbal ability or numeric ability. When intelligence subtests are reported separately, it appears that overall intelligence is the best predictor, while achievement in maths-based subjects is predicted as well by overall intelligence as by a measure of numeric ability (Steinmayr, Zieglerb, & Träublea, 2010). Verbal ability in one study exceeded the predictive ability of an overall measure of intelligence when predicting academic performance in a language-based subject (Steinmayr et al., 2010).

In line with previous findings, overall intelligence was expected to be the strongest predictor of academic achievement in the current study. The current study also considered the predictive value of individual subscales of intelligence.

Personality

Many studies have considered the influence of personality on student achievement across the compulsory schooling sector and in tertiary settings, although one synthesis of 4 meta-analyses on the effect of personality on student achievement found little effect ($d = 0.19$) (Hattie, 2009). While studies have covered a wide range of measures of different personality traits, the majority of studies

concerning student achievement use the Big Five measure of personality, which assesses the five superordinate traits of extraversion, conscientiousness, agreeableness, neuroticism and openness to experience. Each of these superordinate traits is made up of narrower facets (Costa & McCrae, 1992). Funder (2001) found that while these five traits are far from exhaustive, they account for the majority of variance in the personality domain (for a detailed review of other personality traits that have been considered in relation to student achievement, see De Raad & Schouwenburg, 1996). The five variables were originally derived using orthogonal rotation, and can therefore be considered independent (Goldberg, 1990). In reality, when neuroticism is reversed to become a measure of 'Emotional Stability' the five personality variables are usually moderately positively correlated, possibly due to them all being considered socially desirable (Digman, 1997).

Similar to other variables included in the current study, the relationship between each of the Big Five variables and student achievement has varied in individual studies. However, a number of large scale meta-analyses have been conducted, and have been used as a basis for hypotheses in the current study. The earliest meta-analysis considered was conducted by Hough (1992). This study divided findings into a wider grouping of personality variables than the Big Five, making its findings difficult to generalise to the current study. The age of this study also means that it has been largely superseded by more recent meta-analyses. The other three meta-analyses considered have been conducted within the last six years (O'Connor & Paunonen, 2007; Poropat, 2009; Trapmann, Hell, Hirn, &

Schuler, 2007). It is these three meta-analyses that are referred to in the following sections relating to each of the Big Five variables.

Two of the three recent meta-analyses (O'Connor & Paunonen, 2007; Trapmann, Hell, Hirn et al., 2007) specifically considered post-secondary achievement. Additionally, Trapmann, Hell, Hirn et al. (2007) included studies not specifically measuring one of the Big Five domains, such as the California Personality Inventory or the 16 Personality Factor Questionnaire. These traits were included in the meta-analysis if 'they fit the Big Five facets ... sufficiently' (Trapmann, Hell, Hirn et al., 2007, p. 135). Poropat's meta-analysis included studies from a range of different age groups, and excluded studies that did not measure variables from the Big Five model of personality. Thus, the meta-analyses will have a level of overlap in content, but also a degree of difference. It is likely that Poropat's (2009) findings will be the most applicable to the current study, due to the secondary sample and the larger sample of recent studies included.

Many studies have aimed to identify the incremental validity of measures of personality over and above the predictive value of intelligence. One of the meta-analyses discussed also included intelligence as a correlate, and found that conscientiousness explained additional variance to intelligence in predicting achievement (Poropat, 2009). A multiple regression conducted within a study with over 3,000 participants found that conscientiousness added incremental validity to intelligence in predicting secondary school achievement (Laidra et al., 2007). Likewise, another study with secondary aged students found that measures of

personality added incremental validity to the predictive value of intelligence (Di Fabio & Busoni, 2007). The findings of these studies indicated that personality measures in the current study would add incremental validity to the prediction of achievement in Level 3 NCEA.

Extraversion.

There is a large amount of variation between the results of individual studies correlating extraversion with student achievement, with some studies identifying a negative influence on achievement (Busato, Prins, Elshout, & Hamaker, 2000; Furnham & Mitchell, 1991), and others a positive influence (Atashrouz, Pakdaman, & Asgari, 2008). One review of personality findings suggested that extraversion assisted performance because students would be energetic and have a positive attitude (De Raad & Schouwenburg, 1996). Conversely, the same review suggested that extraversion may lead to lower achievement because students would spend excessive time socialising. The meta-analyses suggest that there is little relationship between extraversion and achievement, with mean correlations ranging from $-.05$ (O'Connor & Paunonen, 2007) to $.01$ (Trapmann, Hell, Hirn et al., 2007). However, a meta-analysis specifically considering extraversion found a small positive correlation (Boyd, 2007).

Conscientiousness.

Research consistently links conscientiousness to student achievement and it is a significant predictor of academic achievement in each of the three meta-analyses. The three meta-analyses all found that conscientiousness had a small positive

correlation with measures of student achievement: $r = .22$ (Trapmann, Hell, Hirn et al., 2007), and $r = .24$ (O'Connor & Paunonen, 2007; Poropat, 2009). This correlation dropped slightly when only secondary aged students and secondary aged measures of achievement were taken into account (Poropat, 2009). These findings are supported by the results of individual studies examining the relationship between personality and student achievement (Atashrouz et al., 2008; Chamorro-Premuzic & Furnham, 2003; Di Fabio & Busoni, 2007; Eilam, Zeidner, & Aharon, 2009; Pang, 2009). It seemed likely, therefore, that conscientiousness would be a significant predictor of student achievement in the current study.

Conscientiousness is considered to be the drive to accomplish (Nofle & Robins, 2007). In Years 11 and 12, there is some advantage to achieving a higher number of credits than required, as students can use up to twenty credits for partial satisfaction of their requirements for the following year. In Year 13, however, credits cannot be transferred towards any higher level of qualification, and there are, therefore, limited advantages in attaining credits above the required 80. As a result, there may be a stronger positive relationship between conscientiousness and the number of credits attained by Year 13 students than with the other two achievement variables (proportion of Merit and Excellence credits, and Level 3 attainment), as acquiring a greater number of credits requires more persistence than it does increased ability.

Agreeableness.

The relationship between agreeableness and academic achievement is less consistent than for conscientiousness. It has been suggested that agreeableness may positively influence achievement by aiding student cooperation in learning processes (De Raad & Schouwenburg, 1996). The relationship with achievement was fairly consistent across the three meta-analyses, and ranged from .04 (Trapmann, Hell, Hirn et al., 2007) to .05 (Poropat, 2009). Within individual studies this correlation ranged widely, from -.21 (Diseth, 2003) to .25 (Musgrave-Marquart, Bromley, & Dalley, 1997).

Neuroticism.

Likewise, there has been variation on findings concerning the relationship between neuroticism and student achievement, with some studies finding it negatively correlates with achievement (Chamorro-Premuzic & Furnham, 2003; Gilles & Bailleux, 2001; Maqsud, 1993), and others finding little or no relationship. The three meta-analyses found little relationship, with the mean correlation ranging from -.04 (Trapmann, Hell, Hirn et al., 2007) to .02 (Poropat, 2009). This indicates that any relationship found between neuroticism and achievement in individual studies may be specific to that participant cohort or setting, rather than generalisable.

Openness to experience.

There is similar variation in findings about the predictive value of openness to experience, with the meta-analyses all finding a small, positive mean correlation.

This ranged from .06 (O'Connor & Paunonen, 2007) to .12 (Poropat, 2009). A number of studies have found that openness to experience is positively related to achievement and has value as a predictor (Gilles & Bailleux, 2001; Nofle & Robins, 2007; Pang, 2009), while others have not found a relationship (see O'Connor & Paunonen, 2007, for a list of studies). It is unclear under what circumstances openness to experience is related to achievement, which is shown by the wide range of findings from individual studies.

When the studies included in one meta-analysis were considered separately, the correlation between openness to experience and achievement ranged between -.16 and .30 (Farsides & Woodfield, 2003; O'Connor & Paunonen, 2007; Phillips, Abraham, & Bond, 2003). The 90% confidence interval in the meta-analysis ranged from -.10 to .22, leading O'Connor and Paunonen (2007, p. 977) to speculate that one or more moderator variables may be responsible for determining whether openness to experience exerts a positive or null influence on academic performance.

Attitudes and Beliefs

Theory of intelligence.

Students may have implicit views or theories about the nature of intelligence and, by extension, about their own intelligence. These implicit theories can be divided into two different assumptions, that intelligence is fixed (an entity view) or malleable (an incremental view) (Dweck & Leggett, 1988). An entity theorist

believes that intelligence is a fixed quality that is unable to be changed, and is thus likely to blame negative academic outcomes on a lack of intelligence (Dweck, Chui, & Hong, 1995). An incremental theorist believes that effort can cause intelligence to increase or grow, and is therefore more likely to blame negative outcomes on a lack of effort or a poor choice of strategy (Dweck et al., 1995). Research suggests that students with an entity view of intelligence are likely to give up or withdraw effort from a difficult task, while those with an incremental view are more likely to persevere (Blackwell, 2002).

Participants completing self-report questionnaires of view of intelligence tend to endorse either an incremental view, or both an entity and an incremental view, depending on the instrument (Dweck et al., 1995). Scales are generally measured using Likert scales which require participants to indicate their level of disagreement or agreement with each item. Dweck et al. (1995) suggested that this is due to incremental views being seen as more socially desirable, but validated the scale by asking participants to explain their answers. Their responses were consistent with the hypothesis that participants endorsed one of the views rather than both. Studies have found that students with an incremental view of intelligence tend to have higher levels of academic achievement than those with an entity view (Henderson & Dweck, 1990; Robins & Pals, 2002). There is some evidence that teaching students an incremental view of intelligence contributes to higher achievement (Blackwell, Trzesniewski, & Dweck, 2007; Dweck & Master, 2008). One intervention found the relationship between an incremental theory of

intelligence and mathematics achievement increased to $r = .20$ across the term of the intervention (Blackwell et al., 2007).

Studies show that these attribution effects have a moderating effect on the influence of intelligence on academic success, with those students who view success as due to effort out-performing students of a similar intelligence level who believe that their outcomes are due to ability (Mangels, Butterfield, Lamb, Good, & Dweck, 2006). It is possible that having an incremental view of intelligence causes students to try harder, and that the increased effort results in higher levels of achievement. Conversely, previous academic successes may cause students to make incremental attributions in future academic settings. Either way, it seemed likely that view of intelligence would significantly predict achievement in the current study, and that students with an incremental view of intelligence would have higher levels of performance than those with lower levels.

View of school.

A meta-analysis on the relationship between happiness and cognitive outcomes found a medium effect size ($d = 0.54$), which suggests that happy people tend to have higher levels of achievement on a number of different measures (Lyubomirsky, King, & Diener, 2005). This analysis incorporated a large number of different measures of satisfaction and positive affect, in addition to a wide range of cognitive outcomes, including job and relationship success. The current study is specifically concerned with the effect of satisfaction or happiness on student achievement, and thus studies that have found a relationship between

students' happiness with school and student achievement are of particular interest. These findings indicate that satisfaction with school is related to higher levels of academic achievement (Huebner, 1991; Huebner & Gilman, 2006). It was hypothesised that participants in the current study would have higher levels of achievement if they had a higher level of satisfaction with school, and that this relationship would mediate the influence of students' levels of extraversion and neuroticism, which have been respectively found to positively and negatively influence satisfaction and positive affect (Costa & McCrae, 1980; Huebner, 1991; Rusting & Larsen, 1997). Specifically, it was predicted that extraversion would be linked to having a more positive view of school, and that neuroticism would be linked to having a more negative view of school.

Economic value of education.

Another set of beliefs predicted to relate to student achievement in the current study is the perceived economic value of education. Previous studies have found that secondary aged students tend to have lower levels of achievement if they do not perceive a link between education and financial success (Ford, 1992a, 1992b; Mickelson, 1990). Correlation and regression data demonstrate that students' view of the economic value of education can be used as a predictor of student achievement, with positive views of the value of education correlating positively with student grades ($r = .17$), and perceptions that the benefits of education would not apply personally correlating negatively with student grades ($r = -.26$) (Murdock, Anderman, & Hodge, 2000). The perceived value of education and its influence on academic investment is consistent with the concept of

instrumentality, which forms one of three elements of Vroom's expectancy theory of motivation (Vroom & MacCrimmon, 1968). Instrumentality can be defined as the beliefs an individual holds about whether an outcome will yield desired rewards. Thus, a student's motivation and, by extension, their academic effort may be influenced by their beliefs about whether higher levels of achievement will result in valuable rewards in the form of future financial success. Previous research in the area of economic value of education has tended to focus on the economic value of education perceived by minority ethnicity students, as it is suggested that these students are not as economically advantaged by education as majority ethnicity students (Ford, 1992a). The current study widens the application of this belief, and considers the relationship between perceived economic value and achievement for all ethnic groups.

Parental involvement.

Parental involvement is included in the attitudes and beliefs section of the current study but it is measured as part of a self-report questionnaire. Thus, compared with more objective measures of parental involvement, the current study measures only students' perceptions of their parents' involvement.

A synthesis of eleven meta-analyses on the relationship between student achievement and parental involvement found a medium effect size ($d = 0.51$) (Hattie, 2009). However, there was a large amount of variation within the individual studies, and also variation on the effect of different types of involvement. The effect of parental involvement tended to decrease with age, and

it has little influence on achievement by late secondary school ($d = -0.05$) (Crimm, 1992). Parent aspirations and expectations had a positive effect on achievement, while parental supervision activities such as monitoring homework tended to have a much smaller effect on achievement (Fan & Chen, 2001; Jeynes, 2007). Rosenzweig (2001) found that parental participation in learning and supportive parenting had a large positive effect on student achievement. Epstein (1992) identified six different types of parental involvement, which had varying degrees of relationship with student achievement depending on student age: (1) parental practices to establish a positive home learning environment, (2) parent-school communications about student progress, (3) parent-school communications about learning activities at home, (4) parent participation in school decision-making, (5) volunteering at the school, and (6) parent access to educational community resources.

Two large scale studies using data from The National Educational Longitudinal Study (conducted in the United States of America) found that meeting parental obligations, such as by communicating with students, and having high educational expectations, were strongly positively related to student achievement (Catsambis, 2001; Hong & Ho, 2005). One of these studies specifically considered the achievement of final year secondary students and identified another of Epstein's types of parenting that was significantly related to achievement: support of school (Catsambis, 2001). This includes volunteering at the school and attending school related events. The current study measures these three types of parental involvement, and it was predicted that parental involvement would be positively

related to student achievement. A number of studies comparing multiple family-related correlates to achievement have found that the strength of the relationship of parental involvement with achievement is not as great as the relationship between socio-economic status and achievement (Catsambis, 2001; Eagle, 1989). It was therefore hypothesised that the relationship between achievement and parental involvement in the current study would not be as strong as the relationship between socio-economic status and achievement.

Study Strategies

As previously stated, there are a large number of variables that have been previously demonstrated to relate to student achievement. Likewise, there are a large set of variables describing students' learning styles, study strategies and study skills, and many studies relating these to student achievement. The current study used the Motivated Strategies for Learning Questionnaire to measure student use of study strategies (Pintrich, Smith, Garcia, & McKeachie, 1991). This questionnaire was developed for a similar age group (undergraduate university students) and had previously been administered on a large scale. In addition, a measure of time management was included in the study.

One theory divides learning into three approaches: surface, deep and achieving (Biggs, 1987). Deep learning constitutes strategies that involve exploration and broad understanding of the topic, while surface learning focuses on rote memorisation of material (Chamorro-Premuzic & Furnham, 2008). Achieving focuses on the extrinsic motivation to achieve high levels of performance, and

involves strategies such as organisation and time management (Biggs, 1987). A later factor analytic study recognised deep and surface processing, but labelled the third factor ‘disorganisation’ (Entwistle, 1988). The current study contains scales that fit within the definition of surface processing, in the form of rehearsal strategies, scales that fit within deep processing, in the form of critical thinking and elaboration, and scales that fit within achieving approaches, in the form of organisation and time management.

A number of studies in this area consider overall use of strategies, rather than considering the use of only one or two strategies. Two meta-analyses on the relationship of study strategies with student achievement both found small positive correlations (Purdie & Hattie, 1999; Robbins et al., 2004). Robbins et al. (2004) did not differentiate between the individual skills, while Purdie and Hattie (1999) gave both individual and aggregated results, and concluded that the use of multiple study skills is more strongly linked to achievement outcomes than the use of individual skills. Many of the strategies studied in these meta-analyses were those relating to organisation and time management.

Many studies have identified interactions between the use of study strategies and other variables. One study on theory of intelligence found that students with an incremental view of intelligence were more likely to use effective study strategies (Dweck & Master, 2008). In contrast, those students who had an entity view of intelligence did not tend to use study strategies that actively regulated their learning. An intervention undertaken as part of Dweck and Master’s (2008) study

found that students who were taught a variety of study skills only increased their achievement if they also had an incremental view of intelligence. It was therefore predicted that the current study would identify interactions between theory of intelligence and use of study skills in predicting achievement.

It seemed likely that intelligence would moderate the use of study skills, with one study finding a strong relationship between intelligence and the use of deep processing (Chamorro-Premuzic et al., 2009). There is also a suggestion that people use their intellectual abilities in different ways depending on their level of intelligence. One study found that more intelligent people used their intelligence to regulate and control their lives (Allik & Realo, 1997). This indicated that there was likely to be an interaction between intelligence and use of study skills in the current study, or that intelligence may be associated with the use of a subset of study skills.

While the effects of various personality traits and study strategies on student achievement have been considered in previous studies, there is little existing work on the influence of personality on students' use of study strategies, and the mediating effect this may have on student achievement. Likewise, no studies could be identified that considered the varying levels of effectiveness of these study strategies by considering the possible moderating effects of personality. The current study seeks to explore the interactions between personality, use of study strategies and student achievement. Where this is supported by previous findings, hypotheses about specific relationships between a personality variable and a study

strategy are suggested. However, it was anticipated that there would be interactions identified that extend our existing understanding of the relationship between personality, study strategies and achievement.

Time management.

Lavery's (2008) meta-analysis considered the effect of teaching time management skills, and found a medium effect size on student achievement ($d = 0.44$). Time management skills have also been found to influence student achievement in individual studies (Trueman & Hartley, 1996). It was therefore hypothesised that time management would significantly predict achievement in the current study. Due to the similarity of some subscales of time management with the subscales of conscientiousness, it was anticipated that the use of time management strategies would mediate the effect of conscientiousness when predicting student achievement, in that more conscientious students were predicted to use higher levels of time management strategies.

Organisation strategies.

This is defined as reorganising material to assist learning, and includes both overt and covert rearranging (Lavery, 2008). The meta-analysis of study skills interventions conducted by Lavery (2008) found a large effect of organisational strategy interventions on student achievement ($d = 0.85$). Another meta-analysis on student use of organisation strategies and the relationship with achievement found a small positive correlation (Purdie & Hattie, 1999). It was predicted that organisation strategies would be positively related to student achievement in the

current study and, similar to time management, that organisation strategies would mediate the effect of conscientiousness.

Rehearsal.

Rehearsal strategies are essentially memorisation strategies, and a meta-analysis of studies teaching students to use rehearsal strategies found a medium effect size ($d = 0.57$) (Lavery, 2008). The deep/surface learning dichotomy suggests that rehearsal strategies are essentially surface processing techniques, and studies have found a negative relationship between surface processing and achievement (Purdie & Hattie, 1999). When memorisation is specifically considered, one meta-analysis found little influence on achievement, negative or positive (Purdie & Hattie, 1999). Another review of learning strategies found that rehearsal was positively related to student achievement (Weinstein & Mayer, 1986).

Busato, Prins, Elshout, and Hamaker (1999) found that conscientiousness and extraversion are positively related to use of rehearsal strategies. A structural equation model of the relationship between personality and use of learning strategies found a strong mediating relationship of rehearsal or surface strategies (Diseth, 2003). Neuroticism did not directly relate to achievement in Diseth's (2003) study, but was strongly related to the increased use of surface strategies, which were related to lower levels of achievement. It was predicted in the current study that rehearsal strategies would be positively related to achievement, and that they may mediate the effects of personality variables.

Critical thinking.

Deep learning has been suggested to be synonymous with critical thinking and elaboration strategies (Weinstein & Mayer, 1986), and numerous studies have found a link between use of deep learning and higher levels of achievement (Diseth, 2003; Elliot, McGregor, & Gable, 1999). One meta-analysis found a moderate positive relationship between critical thinking and elaboration strategies and student achievement (Purdie & Hattie, 1999). This was the strongest relationship with achievement of all the positive learning strategies considered in the study.

A number of studies have also found a mediating relationship between openness to experience and use of deep thinking when predicting student achievement (Blickle, 1996; Chamorro-Premuzic & Furnham, 2009; Furnham et al., 2009). A further study found a link between conscientiousness and deep thinking, although this finding is not consistent with previous literature (Zhang, 2003). It was predicted that critical thinking would be positively related to achievement, and that it would mediate the effect of openness to experience. Participants with high openness to experience were predicted to use critical thinking strategies more than low openness to experience participants.

Self-regulation.

One study predicting achievement in middle school students found the use of self-regulation strategies to be among the best predictors of test performance (Pintrich & DeGroot, 1990). In contrast, Purdie and Hattie's (1999) meta-analysis found

little relationship between self-regulation and student achievement. Some studies have found that the use of self-regulation strategies mediated the relationship between conscientiousness and achievement (Blickle, 1996; Eilam et al., 2009). These conflicting findings suggest that the effectiveness of self-regulation strategies may be moderated by the conscientiousness of the participants.

Peer learning.

A synthesis of meta-analyses considering the effectiveness of peer tutoring found a moderate effect size ($d = 0.55$) (Hattie, 2009). Likewise, many studies of cooperative learning have found that it has a positive effect on student achievement (Slavin, 1995). However, Slavin's (1997) review of 46 studies on cooperative learning found that learning in the form of group study without an ensuing group reward does not increase student achievement. The current study measures the extent to which students voluntarily involve their peers in their own learning, such as by asking questions about instructional material. This seems to fit with Slavin's group study cooperative learning method, and it is therefore hypothesised that peer learning would not be significantly related to student achievement.

Chapter 3: Method

In the current study a questionnaire which measured a number of variables previously shown to be related to student achievement was administered to a large sample of Year 13 students. Prior to this survey instrument being administered to the main group of participants, it was piloted with a group of current secondary teachers, who were asked to identify questions or vocabulary they thought would be difficult for students to understand or interpret correctly. Revisions were made based on their suggestions, and the instrument was then piloted with a group of Year 13 students. The students were also asked to identify any questions or vocabulary that they found difficult to understand. Further revisions were made to the questionnaire based on their suggestions. Students who completed the pilot study were not invited to complete the final questionnaire.

Following data collection, each of the scales on the questionnaire was factor analysed and estimates of reliability were computed. This resulted in alterations to the initial scales, as detailed in the relevant sections below. Further information about scale statistics can be found in Chapter 4.

Participants

Participants were 654 Year 13 students from six Christchurch secondary schools. For consistency in achievement information, only schools offering NCEA as their major secondary qualification were invited to participate. The participating schools were all co-educational, state schools. The schools were selected so that

there were two low decile schools (both decile 2), two mid-decile schools (4 and 6) and two high decile schools (both 8).

Each participating school received a report approximately fifty pages in length summarising the results of their students overall, by sex, and by ethnicity. The report also contained a comparison of results from students at that school to students at other participating schools. Privacy rules were applied to the data, and the results of ethnic groups with three or fewer participants were suppressed to preserve the confidentiality of individual participants.

Achievement Variables

The New Zealand Qualifications Authority (NZQA) released NCEA results for Year 13 for each participating student. The data supplied for each student included the total number of credits attained, the number of credits at each achievement level (Not Achieved, Achieved, Merit and Excellence), the highest certificate endorsement gained, and whether University Entrance had been attained. The achievement variables selected for inclusion in the current study are the total number of Level 3 credits attained, the percentage of credits (attempted or achieved) at a Merit and Excellence level, and the endorsement level of their Level 3 qualification. Permission to access this data was given by each participating student at the time of the questionnaire being administered, and the data was released by NZQA in the year following the study.

Instrument

Participants completed a questionnaire consisting of demographic questions and scales measuring the variables described within this section. A copy of the questionnaire is attached as Appendix A. Where possible, scales were adapted from existing, freely available measures. Because of limitations on the time available within the designated timeslots for students to complete the questionnaire, brief scales were preferable to longer measures, and scales were further simplified wherever possible.

The demographic questions were at the beginning of the questionnaire. These were followed by the personality scale, and then the attitudes and beliefs, time management and study strategies. The intelligence scale appeared at the end of the questionnaire. This allowed questions that had the same response format to be grouped for ease of participant understanding. The demographic and intelligence sections had a range of multiple choice and free response formats, the personality scale was answered on a seven-point scale, and the remaining scales were answered on a five-point Likert scale.

The attitudes and beliefs, time management and study strategies items were randomly distributed rather than appearing grouped by scale. Because some of the scales contained items that were similar, randomising the order in which items appeared lessened the chance that respondents would be influenced by their prior response to a similar item.

Demographic information.

The demographic information collected was sex, ethnicity, occupation of principal household earner, home language, family structure and the hours the respondent spent in paid employment.

Socio-economic status was obtained through coding the occupation of the household's principal earner because it was anticipated that participants might not be able to accurately state their combined household income. These occupations were coded according to the New Zealand Socioeconomic Index of Occupational Status (Davis, McLeod, Ransom, & Ongley, 1997), which ranges from 10 – 90. Low scoring occupations include gardeners (22) and housekeepers (27); high scoring occupations include veterinarians and medical doctors (both 90). Occupations that did not fit one of the occupations named in the index were excluded from the analysis. Government beneficiaries were not included in the index, and so were coded as 0 to reflect the lack of independent income.

Personality.

This fifteen item scale comprised five three-item measures of the Big Five personality traits (extraversion, conscientiousness, agreeableness, neuroticism and openness to experience). Each item was phrased as a seven point scale between two semantically opposing personality adjectives (for example, *Unimaginative/Imaginative*, which measures openness to experience, and *Tense/Relaxed*, which measures neuroticism). This measure has been previously used, and each scale has an adequate level of reliability, ranging from .58 - .80

(Boyes & Fletcher, 2007). These reliability levels are lower than some other measures of personality, possibly because, psychometrically, the internal consistency reliability (alpha) of a measure is related to the number of items included in the scale. However, the internal reliability is adequate, and such scales are significantly shorter than other freely available measures of the Big Five.

Estimates of reliability were computed for each school. The Cronbach's alpha coefficient for each scale was .77 for extraversion ($M = 4.81$, $SD = 1.08$), .68 for conscientiousness ($M = 5.08$, $SD = 1.00$), .74 for agreeableness ($M = 5.75$, $SD = 0.87$), .64 for neuroticism ($M = 3.10$, $SD = 1.03$) and .56 for openness to experience ($M = 5.28$, $SD = 0.88$). These were good reliability levels for extraversion and agreeableness, and adequate levels of reliability for the remaining three scales. These levels are commensurate with those found in an earlier study using this measure (Boyes & Fletcher, 2007). Factor analysis of the fifteen personality items supported a five factor structure, with each item loading highest on its hypothesised domain. These five factors accounted for 64% of the total variance in scores.

Attitudes and beliefs.

The attitudes and beliefs scales were entity theory of intelligence (three items), positive view of school (eight items), economic value of education (nine items), and parental involvement (twelve items). Parental involvement was included in this section because the questionnaire was measuring the participants' beliefs about their parents'/caregivers' level of involvement rather than a more objective

measure of involvement. Each of these scales is measured on a five-point Likert scale ranging from 1 (Disagree) to 5 (Agree).

Entity theory of intelligence.

This three item scale is used to measure participants' implicit theory of intelligence (Dweck & Leggett, 1988). The scale consists of only three items because the items were synonymous, and continued repetition might irritate participants (Dweck et al., 1995). The scale's three items all depict an entity theory, due to prior findings that incremental items are endorsed if present, and that participants tend to endorse incremental items more as they progress through a number of theory of intelligence items (Harackiewicz & Elliot, 1995). Internal reliability measures have been high, with a set of validation studies reporting reliabilities between .94 and .98 (Dweck et al., 1995). These levels of reliability reflect the synonymous nature of the items. Example items are *My intelligence is something about me that I can't change very much* and *I can learn new things, but I can't really change my basic intelligence*.

Positive view of school.

The Multidimensional Students' Life Satisfaction Scale (Huebner, 2001) is a scale of students' life satisfaction in five different areas: family, friends, school, self and living environment. This structure has been supported by factor analysis (Huebner, 1994). In the current study, only the eight item school satisfaction subscale was used, which has a previously reported internal reliability of .84 - .85 (Huebner, Laughlin, Ash, & Gilman, 1998).

While this scale has been previously used with students of this age group (Huebner & Gilman, 2006), one item was altered as a result of pilot study feedback. The item *I wish I didn't have to go to school* was interpreted by some students as referring to the legal requirements around school age and attendance, and was subsequently amended to *There is no point in me being at school*. In New Zealand, students are legally required to be enrolled in school between the ages of 6 and 16. Therefore, some pilot participants had trouble interpreting this item because most Year 13 students do not legally have to be enrolled in school.

Two further items were excluded from this scale. Many pilot participants found it difficult to interpret the item *I enjoy school activities*, as they were uncertain whether the question referred to compulsory activities that form part of the delivery of the curriculum, such as field trips or sporting activities, or whether it included voluntary participation in school activities, such as by joining a sports team or cultural club. Some participants were involved in extra-curricular school activities, while others were not. The item was excluded due to this ambiguity.

Likewise, *I like being in school* was excluded because of wide variation amongst pilot participants in its interpretation. Many schools offer senior students the option to study from home during study periods or in designated time slots each week and a number of pilot participants felt the item implied physical presence at schools. Some commented that physically being at school was only one element of their schooling experience, and therefore did not measure their overall attitude

towards schooling. Example items from the final scale used are *I learn a lot at school* and *There are many things about school that I don't like*.

Economic value of education.

The current study used a nine item scale based on Murdock's Benefits and Limitations of Education scales (1999), which were based on an earlier scale by Mickelson (1990) (for example, *I will make more money someday if I do well in school*). Murdock's scale was divided into 10 items measuring the limitations of education ($\alpha = .70$), and five items measuring the benefits of education ($\alpha = .65$). The items all focus on the financial or economic value of education and the extent to which participants believe that education will have a financial return. In short, the scale measures whether education 'pays'. The current study used items with a factor loading of .4 or higher, which resulted in a 9 item measure of economic value of education.

Discussion following the pilot testing revealed that one of these nine items - *I could be successful in life without an education* – was ambiguous, due to there being several possible interpretations of what constituted 'an education'. This item was replaced with the item with the next highest factor loading: *I know many people who have done well in life with little education* (.396).

Parental involvement.

This twelve item scale included items from each of the three types of parental involvement found to be significant predictors of student achievement in the final

year of secondary school (Catsambis, 2001). These three types are parent obligations (*I talk to my parents/guardians about my subject choices*), support of school (*My parents/guardians attend parent interview evenings at school*), and learning activities (*My parents/guardians make sure they have enough money to buy education supplies*). The items were drawn from the variables included in the second follow-up of the National Education Monitoring Project, 1988, which considered the achievement of Grade 12 students in the United States (the equivalent of Year 13 in New Zealand).

Measurement factor model.

Confirmatory factor analysis of the four attitudes and beliefs scales (entity theory of intelligence, positive view of school, education pays and parental involvement) supported the four factor structure when the Kaiser criterion was applied. These factors accounted for 37% of the total variance. Items that did not load above .40 were excluded (Hair, Anderson, Tatham, & Black, 1998). This resulted in one item being excluded from the view of school scale, and two items each being excluded from the education pays and the parental involvement scales. One further item (*Many of the things we do in school seem useless to me*) did not load highest on its hypothesised domain, and so it was shifted from the education pays scale to the positive view of school scale and the items were analysed again. This yielded a four factor structure that explained 43% of the total variance in scores.

The factors retained their original names. Internal reliability was then recomputed for each of the new scales. The Cronbach's alpha coefficients for the scales were

.80 for the three item entity theory of intelligence scale ($M = 2.56$, $SD = 1.01$), .83 for the six item positive view of school scale ($M = 3.48$, $SD = 0.86$), .77 for the six item education pays scale ($M = 3.38$, $SD = 0.75$) and .83 for the ten item parental involvement scale ($M = 3.57$, $SD = 0.76$). These are high levels of reliability for entity theory of intelligence, positive view of school and parental involvement, and adequate for the education pays scale.

Time management.

This fourteen item scale is composed of five items measuring short term time management (*I write a set of goals for myself each day*) and nine items measuring long term time management (*I am still working on a major assignment the night before it is due*) (Britton & Tesser, 1991; Trueman & Hartley, 1996). Both scales have high reliability, with .85 for the short term scale and .71 for the long term scale, and overall reliability of .79.

The original scale phrases the items as questions, but the items were rephrased as statements for the current study so that they could be measured on the same scale as the other study strategy scales making up the questionnaire.

Study strategies.

The six study strategy scales used in the current study were taken from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991). This questionnaire was designed to measure university students' motivation orientation and their use of different learning strategies. The learning strategies

section includes 50 items measuring the use of different learning strategies and student use of available resources. The five learning strategies measured in the MSLQ are organisation, rehearsal, elaboration, critical thinking and metacognitive regulation. The four resource management strategies are peer learning, help seeking, time and study environment, and effort regulation. Four of the five learning strategy scales are included in the current study. Metacognitive regulation was not included because it included three facets: planning, monitoring and regulating. The planning facet is included in the organisation scale in the current study and the monitoring and regulating facets are similar to the effort regulation scale.

Two of the four resource management scales from the MSLQ were included in the current study. Help seeking and time and study environment scales were excluded because their content was more suited to a tertiary environment. A number of the items, such as *I attend class regularly* (time and study environment) or *I ask the instructor to clarify concepts I don't understand well* (help seeking) are more applicable in a secondary school setting than a tertiary setting, and therefore less variation in student responses would be expected than for the other scales.

As the MSLQ was developed for a North American tertiary setting, some vocabulary had to be amended to suit secondary level participants (for example, changing *lectures* to *classes*). Similarly, some vocabulary was altered to a New Zealand synonym, such as *semester* to *term* and *term* to *definition*. Because the United States uses *semester* rather than *term* as a school year measuring unit,

some questions using *term* to mean ideas or concepts caused confusion for pilot study participants if the intended meaning (school term or conceptual term) was not clear from the context. For example, one pilot participant interpreted the item *I make lists of important terms for my classes and memorise the lists* as asking about which school terms were busiest with regards to assessment for each subject. It was altered to *I make lists of important definitions for my classes and memorise the lists*.

Organisation.

This four item scale measures the extent to which the learner selects appropriate information and forms connections between the information to be learned (Pintrich et al., 1991). It has an adequate level of reliability ($\alpha = .64$). An example item is *I make simple charts, diagrams or tables to help me organise class material*.

Rehearsal.

Rehearsal refers to memorisation strategies such as reciting items from a list of information to be learned. It is another four item scale with adequate reliability ($\alpha = .69$), and includes items such as *I make lists of important definitions for my classes and memorise the lists*.

Elaboration.

Elaboration is the process of building connections between the information to be learned, and includes strategies such as paraphrasing. The elaboration scale has

six items, such as *I try to understand the material in this class by making connections between the readings and the concepts from the classes*. This scale has an adequate level of reliability ($\alpha = .76$).

Critical thinking.

The critical thinking scale measures the extent to which students report applying their previous knowledge to new situations to solve problems, reach decisions, or to critically evaluate information and ideas (Pintrich et al., 1991). This five item scale has a high level of reliability ($\alpha = .80$). A sample item is *When I read or hear a conclusion in class, I think about possible alternatives*.

Effort regulation.

This four item scale measures students' ability to control their effort and attention, and includes items such as *I feel so lazy or bored when I study that I quit before I finish what I planned to do*. This scale has an adequate level of reliability ($\alpha = .69$).

Peer learning.

Peer learning includes strategies such as explaining course material to peers or collaborating with peers on academic work. This three item scale has an adequate level of reliability ($\alpha = .76$). A sample item is *When studying, I often try to explain the material to a classmate or friend*.

Measurement factor model.

Confirmatory factor analysis of the 40 study and learning strategies items did not support an eight factor solution. The Kaiser criterion of including factors with an eigenvalue greater than one yielded four factors, which accounted for 36% of the total variance. Items with a loading of less than .40 on any of the factors were then excluded from the analysis. This resulted in twelve items being excluded. The remaining 28 items were analysed again and yielded a four factor structure that explained 42% of the total variance in scores, as shown in Table 1.

The first factor is named Time Management, because it refers to skills specifically related to planning and ordering the use of time. It consists of seven of the fourteen items originally making up the short and long-term time management scales; six from short-term and one from long-term. The second factor is named Critical Thinking as it includes items relating to higher level thinking and critical evaluation of material. It consists of eight of the eleven items that formerly comprised the elaboration and critical thinking measures. The third factor is named Strategic Skills and includes concrete skills and processes for learning and organising study materials. It consists of the three remaining elaboration items, two of the four organisation items, and the four rehearsal items. The final factor is named Self-regulation and measures the ability to discipline oneself and focus on the necessary tasks to be completed. It is made up of two long-term time management items, and two effort regulation items.

Table 1

Pattern Matrix for Study Strategy Scale Items

Scale	Item	Factor 1	Factor 2	Factor 3	Factor 4
Time Management					
	I make a schedule of the activities I have to do on school days.	.69			
	I plan each day before I start it.	.70			
	I write a set of goals for myself each day.	.66			
	I make a list of the things I have to do each day.	.79			
	I spend time each day planning.	.68			
	I have a clear idea of what I want to accomplish during the next week.	.47			
	I have a set of goals for the entire term.	.52			
Critical Thinking					
	I try to apply ideas from class readings in other class activities such as discussions and group work.		.53		
	I try to relate ideas in one subject to those in other subjects whenever possible.		.61		
	When reading for classes, I try to relate the material to what I already know.		.61		
	I often find myself questioning things I hear or read in class to decide if I find them convincing.		.61		
	When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.		.63		
	When I read or hear a conclusion in class, I think about possible alternatives.		.61		
	I treat class material as a starting point and try to develop my own ideas about it.		.59		
	I try to play around with ideas of my own related to what I am learning in this course.		.68		
Strategic Skills					
	I make simple charts, diagrams or tables to help me organise class material.			.56	
	When I study, I go through the readings and my class notes and try to find the most important ideas.			.62	
	When I study, I outline the material to help me organise my thoughts.			.61	
	When I study, I read my class notes and the course readings over and over again.			.62	
	I make lists of important definitions for my classes and memorise the lists.			.48	
	When I study, I practise saying the material to myself over and over.			.57	
	I memorise key words to remind me of important concepts in class.			.62	
	When I study, I write brief summaries of the main ideas from the readings and the concepts from the classes.			.62	
	When I study, I pull together information from different sources, such as classes, readings and discussions.			.53	
Self-regulation					
	I feel so lazy or bored when I study that I quit before I finish what I planned to do. (R)				.64
	I am still working on a major assignment the night before it is due. (R)				.40
	I make constructive use of my time.				.45
	When class work is difficult, I give up or only study the easy parts. (R)				.50
	Eigenvalue	3.54	3.56	3.46	1.31
	Variance explained	12.66	12.72	12.36	4.68

Hierarchical factor analysis was used to calculate correlations between the oblique factors. Correlations between the scales are shown in Table 2. As would be expected, each of the factors correlates positively with the other factors. Next, estimates of reliability were recomputed for each of the new scales. The Cronbach's alpha coefficient for each scale was .85 for the seven item Time Management scale ($M = 2.39$, $SD = 0.91$), .84 for the eight item Critical Thinking scale ($M = 3.24$, $SD = 0.75$), .84 for the nine item Strategic Skills scale ($M = 3.37$, $SD = 0.79$) and .60 for the four item Self-regulation scale ($M = 2.92$, $SD = 0.75$). These are high levels of reliability for Time Management, Critical Thinking and Strategic Skills, and adequate reliability for Self-regulation.

Table 2

Correlations between Factors (N = 654)

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1.00	.31	.46	.40
Factor 2		1.00	.42	.30
Factor 3			1.00	.38
Factor 4				1.00

Intelligence.

This is a 21 item scale which measures students' verbal (7 items), mathematical (7 items) and critical reasoning (7 items) intelligence. Participants indicated their answer either through free response or by checking the box next to the appropriate multiple choice answer.

The scale was compiled from a free 38 item online intelligence test (The IQ Test, 1999). The teacher pilot group completed the 38 item intelligence test. Following this, the scale was reduced to 21 items by eliminating items that had taken a long time to complete or appeared too easy or difficult. Confirmatory factor analysis of the scale yielded a single factor, which can be termed total intelligence. Thus, total intelligence will also be considered as a variable, in addition to each of the three original subscales. The Cronbach's alpha coefficient was .82 for the total scale ($M = 13.50$, $SD = 4.28$), .66 for the verbal scale ($M = 4.58$, $SD = 1.76$), .74 for the mathematical scale ($M = 3.96$, $SD = 2.03$) and .52 for the critical reasoning scale ($M = 4.94$, $SD = 1.44$). This is a high level of reliability for the total scale, and adequate levels of reliability for the individual scales.

Procedure

Participating schools were told that briefing the students on the study and answering questions from the students would take 10 minutes, and that completing the questionnaire would take 30 minutes. Schools decided on a suitable time and venue for the study to take place. All scheduled sessions took place in August and early September, 2008. The venues chosen ranged from school to school, but all schools provided a venue that included a desk or flat writing surface for each student. Some sessions were held during form time, and some were held during a regular class period, with instruction suspended for that period. No schools asked students to participate in their own time. Due to period timing, two schools chose to have the briefing on a separate day to the questionnaire completion session. The remaining four schools chose to have the

briefing and questionnaire completed in the same session. All briefing and administration sessions were conducted by the researcher. Staff members from participating schools assisted with distributing the material and supervising the completion of the questionnaire, but did not address the participants.

Participants at the two schools which had the information session on a previous day were given verbal information about the study by the researcher and were told that their participation in the study was voluntary, and that they would receive a four page individual profile based on their results if they did choose to participate. An example of the profile is attached as Appendix B. Each student was given an information sheet (Appendix C) and was given time to read the information sheet and ask any questions about the study. Students were given instructions about the time and date the questionnaire session would take place, and were asked to attend this session if they wished to participate in the study.

Participants at the other four schools received the information sheet at the same time as they received the questionnaire. The researcher gave students the same verbal information about the study and students were given time to read the information sheet and ask questions. Following this, students were asked to leave if they did not wish to participate, or to remain behind if they wished to participate.

At each questionnaire session, participants received an envelope containing the questionnaire, a consent form (Appendix D) and a pen. The consent form gave the

researcher permission to use the participant's questionnaire and to access their NCEA results for Year 13. Participants were instructed to complete the consent form and questionnaire, then to place the completed questionnaire and consent form in the envelope, seal the envelope and sign the envelope across the seal. This assured participants of the confidentiality of their results and minimised bias to their responses by eliminating the chance that their teacher or other school personnel may have access to their results.

Chapter 4: Results and Discussion

Each of the sets of results is dealt with in its relevant section. For continuous variables, a number of correlation matrices are reported between achievement variables and the results presented in that section. For a correlation matrix of all variables, see Appendix E.

Listwise deletion was used for each of the analyses and so correlations vary slightly depending on the sample of participants included in that analysis.

For categorical variables, significance tests examining the effect of each individual variable are reported in the relevant section. These analyses used for considering the effects of individual variables are t-tests for independent means or analysis of variance (ANOVA). The use of a large number of these analyses necessitates a consideration of the resulting increase in type 1 error. While type 1 error is largely protected against by the inclusion of three highly-correlated dependent variables in the form of the three achievement variables, it is important to also consider the individual results in conjunction with the results of the analyses that consider multiple variables (the regression analyses and structural equation model).

The findings for individual variables are briefly discussed in the applicable sections. The section is structured in this way due to the large number of separate results for individual variables. A clearer understanding can be gained by grouping relevant sets of results and the discussion pertaining to those results and the reader does not then have to relate later discussion back to the relevant parts of

the results section. A discussion of overall findings is included in the General Discussion section of this chapter.

Response Rates

The question with the fewest responses was occupation. 83 respondents did not answer the question and 41 responses could not be coded, yielding 540 useable responses. If participants missed a single question on the personality, attitudinal or study skills questionnaires, the participant's mean score for that scale was calculated based on the lower number of responses and has been included in the analysis. If they missed more than a single response, they were not included in the analysis for that scale. The response rates and scale statistics for continuous variables are shown in Table 3.

Table 3

Scale Statistics

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	α
Demographics						
Employment	652	6.07	6.81	0	48	-
Socio-economic status	540	59.04	19.79	0	90	-
Personality						
Extraversion	652	4.81	1.08	1	7	.77
Conscientiousness	652	5.08	1.00	1	7	.68
Agreeableness	654	5.75	0.87	1	7	.74
Neuroticism	652	3.10	1.03	1	7	.64
Openness to Experience	652	5.28	0.88	1	7	.56
Attitudes and Beliefs						
Entity Theory of Intelligence	654	2.56	1.01	1	5	.80
Positive View of School	654	3.48	0.86	1	5	.83
Education Pays	654	3.38	0.75	1	5	.77
Parental Involvement	654	3.57	0.82	1	5	.83
Intelligence						
Verbal	654	4.58	1.76	0	7	.66
Mathematical	654	3.96	2.03	0	7	.74
Critical Reasoning	654	4.95	1.44	0	7	.52
Total	654	13.50	4.28	0	21	.82
Study Strategies						
Time Management	654	2.39	0.91	1	5	.85
Critical Thinking	654	3.24	0.75	1	5	.84
Strategic Skills	654	3.37	0.79	1	5	.84
Self-regulation	654	2.92	0.75	1	5	.60
Achievement						
Credits	654	80.44	30.61	4	154	-
Merit and Excellence	654	26.78	24.43	0	97	-
Level 3 attainment	654	2.02	0.83	1	4	-

Achievement Variables

The mean number of credits that participants achieved was 80.44, and ranged from 4 to 154, with a standard deviation of 30.61. The national mean number of

credits achieved was 64.24. This is the number of Level 3 credits accumulated by participants across the 2008 academic year and includes all credits at Achieved, Merit and Excellence levels. The percentage of credits that were attained at Merit and Excellence levels is a percentage of all credits attempted, and the total credits for calculating this percentage includes credits that were attempted but not attained. The percentage of credits ranged from 0% to 97%, with a mean of 26.78% and a standard deviation of 24.43% (compared with a national mean of 24.98%).

The third achievement variable analysed is whether participants attained a Level 3 (or above) qualification, and what the endorsement level of this qualification was. 174 participants (26.60%) did not attain a Level 3 (or above) qualification during their Year 13 year (46.62% nationally), while 50.15% (328) attained a Level 3 qualification with no endorsement (39.83% nationally). Of the remaining 150 participants, 109 attained a Level 3 certificate with Merit (16.67%; 10.91% nationally), and 41 attained a Level 3 certificate with Excellence (6.27%; 2.64% nationally).

As shown in Table 4, the correlations between each of these achievement variables are positive and large. This would be expected given that the three variables are measuring different facets of the same construct. However, the three variables are not perfectly correlated, suggesting that there is value in retaining more than one measure of achievement.

Table 4

Correlations between Achievement Variables (N = 654)

	Credits	Merit and Excellence	Level 3 attainment
Credits	1.00	.64**	.75**
Merit and Excellence	.64**	1.00	.82**
Level 3 attainment	.75**	.82**	1.00

* $p < .05$, ** $p < .01$ **Demographic Information**

The demographic breakdown of participants is shown in Table 5. It should be noted that not all participants responded to all of the demographic questions. School decile was obtained by coding participant responses as they were collected at each school.

Participants could select more than one response for some demographic questions. Ethnicity was coded according to Ministry of Education prioritisation guidelines. This meant that participants who selected multiple ethnicities were only included in one ethnic grouping. The highest ethnic categorisation in this system is Māori, followed by Pasifika, Asian, Other and New Zealand European. This means that a student selecting the NZ European, Māori and Pasifika options would be coded as Māori, or a student selecting the Pasifika and Other options would be coded as Pasifika. This prioritisation affected 34 participants. Likewise, prioritisation was applied to the coding of family structure. Students were asked to indicate who they lived with from a list of options. The highest structure categorisation is nuclear, and students were coded having a nuclear structure if they lived with both

biological parents, regardless of whether other people lived with them. Solo families were categorised second, with participants counted as living in a single parent family if they lived with one biological parent and did not live with a stepparent or parent's de-facto partner. Blended families included those living with a biological parent and an unrelated partner of the parent. Extended families included those living with only extended family members, and not those living with extended family as well as one or both biological parents.

The mean occupation score was 59.00, and ranged from 0 (beneficiaries, not classified under the scale) to 90, with a standard deviation of 19.79. Occupations were further categorised into low (10 – 50), medium (51 – 65) and high socio-economic (66 – 90) occupations. Participants worked an average of 6.07 hours per week. This ranged from 0 hours per week to 48 hours per week, with a standard deviation of 6.81.

The majority of participants in the study attended high decile schools (deciles 8 – 10). Nationally in 2008, 18% of secondary students attended low decile schools (deciles 1 – 3), 48% attended medium decile schools (4 – 7), and 34% attended high decile schools. However, because retention rates are lower at lower decile schools, many students leave school before Year 13. Therefore, in Year 13 nationally only 16% of students attended low decile schools, 45% attended medium, and 39% attended high decile schools. In Christchurch, where this study was conducted, this trend is further emphasised by a comparatively higher decile profile than nationally. Thus, the high number of participants at high decile

schools reflects the comparatively high retention rates at higher decile schools and the higher proportion of secondary schools in Christchurch which are high decile.

Table 5

Demographic Characteristics of Participants

Variable	<i>N</i>	Percentage
Participant level (<i>N</i> = 654)		
Sex		
Male	312	47.71%
Female	342	52.29%
Ethnicity		
NZ European	363	55.59%
Māori	42	6.43%
Pasifika	22	3.37%
Asian	157	24.04%
Other	69	10.57%
Family Structure		
Nuclear	409	63.21%
Solo parent	156	24.11%
Blended	34	5.26%
Extended	19	2.94%
Other	29	4.48%
Home Language		
English	511	78.86%
Other	137	21.14%
School Decile		
Low	69	10.55%
Medium	117	17.89%
High	468	71.56%
Socio-economic status		
Beneficiary	16	2.96%
Low	142	26.30%
Medium	181	33.52%
High	201	37.22%
Employment		
None	262	40.18%
Low (<10 hrs/wk)	238	36.50%
High (>10 hrs/wk)	152	23.31%

A correlation was performed between participants' school decile, the socio-economic status of the principal earner's income, and the number of hours they spent in paid employment each week (see Table 6). This was performed to ascertain whether these three measures were measuring different constructs, or whether they were all measures of socio-economic status. The correlations were all statistically significant and were in the direction expected. Higher decile is related to higher socio-economic status occupations, and both are related to a smaller number of hours per week spent in paid employment. The correlations were all small, suggesting that the three variables are related, but are measuring three different constructs.

Table 6

Correlations between Demographic Variables (N = 539)

	School	Occupation	Employment
School decile	1.00	.28**	-.16**
Occupation	.28**	1.00	-.17**
Employment	-.16**	-.17**	1.00

* $p < .05$, ** $p < .01$

Each of these demographic categories was subjected to significance testing for each of the three achievement variables. Table 7 shows that females achieved significantly higher results than males for each of the three categories. Each of these had a small effect size. This supports previous New Zealand findings that female students academically outperform males, with females scoring significantly higher on all academic measures.

Table 7

Comparison of Achievement for Male and Female Participants

	Male (<i>N</i> = 342)		Female (<i>N</i> = 312)		<i>t</i> value	<i>p</i>	<i>d</i>
	M	SD	M	SD			
Credits	76.10	33.17	84.40	27.53	-3.49	.01	.27
Merit and Excellence	23.71	24.55	29.57	24.02	-3.09	.01	.24
Level 3 attainment	1.94	0.85	2.10	0.80	-2.62	.01	.19

Table 8 shows that the Asian participants had the highest levels on each of the three achievement variables, followed by New Zealand European participants and then other participants. Māori participants attained a higher percentage of credits at Merit and Excellence levels and a higher level of Level 3 endorsement than Pasifika participants, but attained fewer credits overall than Pasifika participants. These differences were all statistically significant. Previous New Zealand findings have identified large achievement gaps between the different ethnic groups. These are supported by the finding that Māori and Pasifika had lower levels of achievement than other ethnic groups in the current study. The effect size of being Māori rather than non-Māori was large for the number of credits attained and the proportion of credits at Merit and Excellence level ($d = -0.82$ and $d = -0.65$ respectively) and medium for Level 3 attainment ($d = -0.46$). For Pasifika participants, the effect size was large for all three achievement variables ($d = -0.74$ for credits attained, $d = -0.80$ for Merit and Excellence credits, and $d = -0.78$ for Level 3 attainment).

Table 8

Comparison of Achievement for Different Ethnicity Groups

	NZ European (<i>N</i> = 363)	Māori (<i>N</i> = 42)	Pasifika (<i>N</i> = 22)	Asian (<i>N</i> = 157)	Other (<i>N</i> = 69)		
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	<i>F</i> value (4,648)	<i>p</i>
Credits	81.88 (29.15)	57.40 (30.29)	58.68 (32.69)	88.36 (28.92)	75.84 (31.85)	12.79	.01
Merit and Excellence	27.16 (23.88)	12.03 (18.24)	8.08 (11.73)	33.36 (26.09)	24.61 (23.16)	10.63	.01
Level 3 attainment	2.05 (0.79)	1.67 (0.75)	1.41 (0.59)	2.21 (0.91)	1.87 (0.80)	8.00	.01

There were significant differences for each of the three achievement variables depending on the structure of the participant's family (see Table 9). Participants living in a nuclear family structure had the highest levels of achievement, followed by participants living in other family structures (most commonly homestay situations with unrelated adults), then participants living in solo family structures. Participants living in blended or extended family structures had the lowest levels of achievement. When participants in solo families were compared to those in nuclear families, there was a small effect size for all achievement variables ($d = -0.23$ for credits attained, $d = -0.22$ for Merit and Excellence credits, and $d = -0.22$ for Level 3 attainment).

This question may have created bias because it asked students to indicate the people that they lived with rather than whether they came from a two or one-parent family. The question was therefore more accurately a measure of living situation rather than family composition. A number of students, for example, lived

in homestay arrangements with extended family members or unrelated adults, and the questionnaire failed to capture whether they had a two-parent or one-parent family. Future research could instead include a measure that specifically captures this information.

Table 9

Comparison of Achievement for Different Family Structures

	Nuclear (<i>N</i> = 409)	Solo (<i>N</i> = 156)	Blended (<i>N</i> = 34)	Extended (<i>N</i> = 19)	Other (<i>N</i> = 29)		
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	<i>F</i> value (4,642)	<i>p</i>
Credits	83.55 (30.44)	76.40 (30.77)	75.00 (31.57)	64.32 (28.16)	79.34 (27.91)	3.37	.01
Merit and Excellence	29.32 (24.71)	23.85 (24.47)	18.70 (18.08)	15.61 (21.04)	26.81 (24.70)	3.63	.01
Level 3 attainment	2.10 (0.74)	1.92 (0.80)	1.88 (0.64)	1.63 (0.83)	2.07 (0.84)	2.89	.02

There were no significant differences in achievement for participants who spoke English at home compared to participants who spoke another language at home. This contradicts previous findings on the achievement gap between native and non-native English speakers. There are several possible explanations for this finding. Firstly, the same limitation as for family structure applied to home language, with participants living in homestay situations frequently reporting speaking English at home. Perhaps a more accurate measure would have been to ask respondents their native language.

Secondly, the nature of the achievement variables may have created a restricted sample. The current study only included full-time students enrolled in a full-time

Year 13 course that included at least some Level 3 credits. This meant that some special needs students who completed the questionnaire in one participating school's special needs unit were later excluded from the dataset. Likewise, it is possible that non-native speakers of English must have attained a sufficient level of English for schools to consider enrolling them in an English-medium Level 3 course. Students with lower levels of English may instead be directed to foundation courses or other non-NCEA courses. Future research could consider the effect of coming from a non-English speaking background on achievement levels at a variety of different age groups, and could further consider the extent to which English competency effects a student's entry into a Level 3 course.

Table 10 shows that participants at higher decile schools had significantly higher levels of attainment than participants at medium or low decile schools. Likewise, participants at medium decile schools had higher levels of attainment than those at low decile schools.

Table 10

Comparison of Achievement for Different Decile Groups

	Low (<i>N</i> = 69)		Medium (<i>N</i> = 117)		High (<i>N</i> = 468)		<i>F</i> value (2,651)	<i>p</i>
	M	SD	M	SD	M	SD		
Credits	58.90	35.31	71.74	34.49	85.80	26.78	31.71	.01
Merit and Excellence	8.94	13.10	13.84	17.58	32.65	24.69	56.52	.01
Level 3 attainment	1.51	0.58	1.75	0.72	2.17	0.84	29.23	.01

For the number of credits attained and the level of certificate endorsement attained, mean results increased with the level of socio-economic status, as shown in Table 11. For the percentage of Merit and Excellence credits, participants from a low socio-economic background achieved a slightly smaller percentage of credits at these levels than participants from a beneficiary background.

Table 11

Comparison of Achievement for Different Socio-Economic Status Levels

	Beneficiary (<i>N</i> = 16)	Low (<i>N</i> = 142)	Medium (<i>N</i> = 181)	High (<i>N</i> = 201)		
	M (SD)	M (SD)	M (SD)	M (SD)	<i>F</i> value (3, 536)	<i>p</i>
Credits	69.44 (30.66)	75.63 (28.92)	82.99 (28.46)	90.97 (27.67)	9.62	.01
Merit and Excellence	21.92 (22.57)	21.81 (21.82)	27.03 (23.70)	36.21 (25.57)	11.24	.01
Level 3 attainment	1.81 (0.83)	1.91 (0.75)	2.04 (0.76)	2.34 (0.85)	9.72	.01

Participants who did not work had significantly higher levels of attainment than those who worked more than 10 hours per week (see Table 12). However, participants who worked up to ten hours per week had the highest levels of attainment on all three achievement variables. Thus, a moderate level of employment was related to higher levels of academic achievement than either no employment, or a large number of hours spent in employment. Thus there is a more complex relationship between employment and achievement than captured by viewing employment as only a continuous measure. It is possible, given previous findings, that students who do not work have a low level of motivation

towards both academic and employment-related activities, and thus have low levels of achievement. High levels of employment may result in less time being spent on academic activities, resulting in lower levels of achievement. Perhaps, then, a moderate level of employment indicates that the participant is both motivated to engage in a variety of activities, and yet still retains sufficient time to invest adequately in their academic activities.

Table 12

Comparison of Achievement for Employment Levels

	None (<i>N</i> = 262)		Low (<i>N</i> = 238)		High (<i>N</i> = 152)		<i>F</i> value (2,649)	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Credits	78.97	32.45	86.42	28.61	73.74	28.75	8.69	.01
Merit and Excellence	27.72	25.60	31.36	25.21	18.05	18.25	14.67	.01
Level 3 attainment	2.03	0.89	2.20	0.82	1.75	0.65	14.09	.01

As shown in Table 13, when decile, occupation and employment are correlated against the achievement variables in their raw form, higher decile and higher socio-economic occupations relate to higher achievement levels, and higher hours spent in paid employment relates to lower achievement levels. Both measures of socio-economic status (decile and parental occupation) were significantly related to all achievement variables, as hypothesised.

Table 13

Correlations between Demographic and Achievement Variables (N = 539)

	1	2	3	4	5	6
School decile (1)	1.00	.28**	-.16**	.28**	.35**	.27**
Occupation (2)		1.00	-.17**	.20**	.23**	.20**
Employment (3)			1.00	-.14**	-.22**	-.17**
Credits (4)				1.00	.61**	.73**
Merit and Excellence (5)					1.00	.81**
Level 3 attainment (6)						1.00

* $p < .05$, ** $p < .01$

Similarly, the correlation was higher for the school-level measure (decile) than the student-level measure (occupation), which is also consistent with previous research (White, 1982). Hence, achievement is more related to the school attended by the student than the personal financial circumstances of their family. This finding is related to previous findings in that it recognises the influence of socio-economic status. However, the usual conception of socio-economic status is at an individual or family-level, while the current findings suggest a community or school level measure is more influential.

It is important to acknowledge the limitations of the measure of student-level occupation used. Not all of the occupations reported could be categorised against the index used (41 were excluded for this reason), and it seems likely that the same title did not necessarily always refer to the same level of occupational status. For example, clarifying the job title ‘manager’ by adding that the parent is a

manager of a food service outlet would result in a different rating than a student who simply submitted 'manager'. A more exact measure of personal socio-economic status might result in altered findings. One previous study found that measures of socio-economic status produce greater effect sizes when information on socio-economic status was collected from parents than from students (Sirin, 2005). It is also important to note that parental occupation was the least answered question apart from three of the more difficult intelligence test questions, and that the inability to code some responses compounded the already low response rate for the occupation question.

Personality

Table 14 shows the relationship between personality and achievement. All of the five personality scales were significantly correlated with one another. Extraversion and agreeableness did not have statistically significant correlations with any of the achievement variables. Neuroticism had a small positive correlation with the percentage of Merit and Excellence credits attained and the level of certificate endorsement. Conscientiousness and openness to experience were correlated with each of the three achievement variables. Both of these variables were correlated .14 with credits attained, but openness to experience had the strongest correlations with the other two achievement variables.

Table 14

Correlations between Personality and Achievement Variables (N = 652)

	1	2	3	4	5	6	7	8
Extraversion (1)	1.00	.20**	.34**	-.33**	.39**	-.02	.03	.02
Conscientiousness (2)		1.00	.50**	-.23**	.31**	.14**	.09*	.10**
Agreeableness (3)			1.00	-.40**	.43**	.01	.02	.01
Neuroticism (4)				1.00	-.27**	.04	.08*	.09*
Openness (5)					1.00	.14**	.29**	.24**
Credits (6)						1.00	.63**	.75**
Merit and Excellence (7)							1.00	.82**
Level 3 attainment (8)								1.00

* $p < .05$, ** $p < .01$

The hypothesised relationship between conscientiousness and achievement was found. Also as hypothesised, the correlation was stronger between conscientiousness and the number of credits attained than for the other two achievement measures. There was no significant relationship between extraversion and achievement, or between agreeableness and achievement. Contrary to what was predicted, however, neuroticism was significantly related to two of the achievement variables. Previous studies have tended to find either little relationship or a negative relationship, and so this finding is unusual as neuroticism positively related to the percentage of Merit and Excellence credits attained, and to Level 3 attainment. Further research should be undertaken into this relationship before it is generalised to other settings, to determine whether this relationship is a feature of this cohort or if there is some feature of Year 13 achievement that differentiates it from other measures of achievement shown to

relate negatively to neuroticism. It is possible that some aspect of the participant cohort in the current study differed from a general student population.

Attitudes and Beliefs

Table 15 shows the relationship between attitudes and achievement. Entity theory of intelligence is negatively related to having a positive view of school, meaning that as a participant's endorsement of an entity view of intelligence increases, their positive view of school decreases. It is also negatively related to the percentage of Merit and Excellence credits attained, but is not significantly correlated with the other two achievement variables. This finding is contrary to a number of previous studies that found a significant relationship between having an entity theory of intelligence and student achievement.

Table 15

<i>Correlations between Attitudes and Achievement Variables (N = 654)</i>							
	1	2	3	4	5	6	7
Entity Theory of Intelligence (1)	1.00	-0.14**	0.00	-0.03	-0.09	-0.11**	-0.06
Positive View of School (2)		1.00	0.29**	0.28**	0.14**	0.13**	0.12**
Education Pays (3)			1.00	0.06	0.16**	0.12**	0.10**
Parental Involvement (4)				1.00	0.12**	0.11**	0.11**
Credits (5)					1.00	0.64**	0.75**
Merit and Excellence (6)						1.00	0.82**
Level 3 attainment (7)							1.00

* $p < .05$, ** $p < .01$

A number of previous studies used younger students as participants, and so it was considered possible that younger students had a different average tendency than their older counterparts. However, a comparison of the mean score in the current study with mean scores in past studies showed that the mean score in the current study (once adjusted for scale differences) was similar to previous studies (2.56 in the current study compared to 2.96 in Dweck et al., 1995). Another possibility is that the current participants are more vulnerable to social desirability and so have tended toward answers that support an incremental view even though this is not reflective of their true beliefs. Future research could include a practical exercise to validate students' self-report measures of view of intelligence (Schunk, 1995). The significant negative correlations between entity theory of intelligence and three of the study strategies scales (Appendix E) suggest that students in this study with an incremental view of intelligence were more likely to use these study strategies than students with an entity view. This is consistent with previous findings (Dweck & Master, 2008).

Positive view of school has a moderate positive relationship with education pays and parental involvement scores. It is also positively correlated with each of the three achievement variables and each of the four study strategies scales (Appendix E). Previous literature has not placed much emphasis on the role of students' satisfaction with school on their subsequent achievement, which contrasts with the huge body of literature investigating the importance of job satisfaction in occupational performance. Future research should consider the factors that comprise view of school, and should determine whether student view of school

can be altered and, if so, whether this causes a corresponding increase in achievement. Likewise, future research should apply these findings to a wider age range across the compulsory schooling sector. This may reveal a stronger relationship when it is considered that younger students are compulsorily required to be enrolled in school, while students in the current study are of an age that they may legally choose to leave school and would feasibly do so if they disliked it sufficiently. The mean score of 3.48 on the positive view of school scale is above the midpoint, suggesting that participants were, on average, more satisfied with school than dissatisfied.

It is also important to consider the potential role of achievement in determining student view of school. There may be a cyclical effect, in that students who are receiving positive feedback in the form of high grades may feel more positively disposed towards school than those who receive lower grades (Ainley, Foreman, & Sheret, 1992).

Students who believed that education pays had significantly higher achievement levels than students with lower economic beliefs. Parental involvement was also positively related to the three achievement variables and correlated positively with each of the study skills scales. One of the limitations of the parental involvement measure, which has been previously discussed, is that it is a self-report measure of the students' perceptions of their parents' involvement in their learning. This makes it prone to bias if the students have an inaccurate perception of this involvement. Future research could overcome these measurement weaknesses by

triangulating the results with a parent/caregiver questionnaire. Future research could also explore the impact of parental involvement at a younger age on Year 13 achievement.

Study Strategies

Table 16 shows the relationship between the study strategies scales and achievement. All four study strategy scales were significantly positively correlated with one another. This suggests that participants are likely to use (or not use) several study strategies rather than apply a single strategy in isolation. The scale means (as shown in Table 3) suggest that time management and self-regulation strategies are used less than critical thinking and strategic skills. Time management and self-regulation strategies had mean scores below the midpoint of the scale (2.39 and 2.92 respectively) while the other two strategies had means above the scale midpoint.

Each of the four scales also have significant positive correlations with each of the three achievement variables, with the exception of critical thinking and the number of credits attained. These correlations tend to be quite small, with the strongest relationship between critical thinking and Merit and Excellence credits attained ($r = .20$).

Table 16

Correlations between Study Strategies and Achievement Variables (N = 654)

	1	2	3	4	5	6	7
Time Management (1)	1.00	0.29**	0.45**	0.35**	0.08*	0.10*	0.09*
Critical Thinking (2)		1.00	0.39**	0.28**	0.02	0.20**	0.13**
Strategic Skills (3)			1.00	0.36**	0.16**	0.14**	0.12**
Self-regulation (4)				1.00	0.16**	0.16**	0.16**
Credits (5)					1.00	0.6**	0.75**
Merit and Excellence (6)						1.00	0.82**
Level 3 attainment (7)							1.00

* $p < .05$, ** $p < .01$

For all the study strategies measures, it is important to remember that the measure was a self-report measure, and is therefore prone to bias by students who perceive high levels of study strategies as socially desirable or are self-deceptively optimistic in their responses. A more robust verification of these levels could be attained in future studies by triangulating self-report measures with observation methods.

Intelligence

Participants scored a mean of 4.58 on the verbal intelligence scale (SD = 1.76), 3.96 on the mathematical intelligence scale (SD = 2.03), and 4.95 on the critical reasoning scale (SD = 1.44). Marks on each scale ranged from 0 to 7. The mean score on the combined intelligence scale was 13.50 (SD = 4.28), with a range from 0 to 21.

Table 17 shows the relationship between intelligence and achievement. The three intelligence subscales were strongly positively correlated with one another, and were very strongly correlated with total intelligence. The three subscales are also strongly positively correlated with each of the three achievement variables, although total intelligence is more strongly related to the three achievement variables than any of the individual subscales are.

Table 17

Correlations between Intelligence and Achievement Variables (N = 654)

	1	2	3	4	5	6	7
Verbal (1)	1.00	0.42**	0.52**	0.79**	0.32**	0.30**	0.30**
Mathematical (2)		1.00	0.57**	0.84**	0.39**	0.41**	0.42**
Critical Reasoning (3)			1.00	0.82**	0.35**	0.40**	0.38**
Total Intelligence (4)				1.00	0.44**	0.45**	0.45**
Credits (5)					1.00	0.64**	0.75**
Merit and Excellence (6)						1.00	0.82**
Level 3 attainment (7)							1.00

* $p < .05$, ** $p < .01$

Regressions

In order to determine the independent contribution of each predictor, three separate regression analyses were run using the Enter method. Each regression analysis used one of the three achievement variables as a criterion variable and the remaining variables as predictor variables. Sex, home language ethnicity and family structure were dummy coded, which created one sex variable (male/female), one language variable (English/Other), two ethnicity variables

(Māori/Non-Māori, Pasifika/Non-Pasifika), and one family structure variable (Nuclear/Solo).

These models accounted for 29.9% of the variance in credits attained ($R^2 = .30$, $F(23,508) = 9.42$, $p < .05$), 40.1% of the variance in the percentage of Merit and Excellence credits attained ($R^2 = .40$, $F(23,508) = 14.77$, $p < .05$), and 32.1% of the variance in Level 3 attainment ($R^2 = .32$, $F(23,508) = 10.45$, $p < .05$).

Variables that were not significant at $p < .05$ using a beta criterion were then excluded from the regression analysis to give the targeted regression results shown in Table 18. Eleven variables predicted 28.8% of the variance in credits attained ($R^2 = .29$, $F(12,538) = 18.22$, $p < .05$). Of these, mathematical intelligence was the strongest predictor ($\beta = .26$). This was followed by decile ($\beta = .15$). Nine variables predicted 37.7% of the variance in the percentage of Merit and Excellence credits attained ($R^2 = .38$, $F(9,640) = 43.12$, $p < .05$). The two strongest predictors were school decile ($\beta = .27$) and openness to experience ($\beta = .27$). There were also nine predictor variables in the Level 3 attainment regression. These nine variables predicted 31.4% of the variance in Level 3 attainment ($R^2 = .31$, $F(9,640) = 32.62$, $p < .05$). The two strongest predictors were mathematical intelligence ($\beta = .23$) and openness to experience ($\beta = .21$). Each of the three achievement variables had a slightly different regression equation. Proportion of Merit and Excellence credits and Level 3 attainment had the same predictors, while the number of credits attained had some different predictors. This supports

the suggestion that the number of credits attained is a measure of academic perseverance, while the other two variables measure academic capacity.

Table 18

Regression Results for Prediction of Achievement Variables

	Credits		Merit and Excellence		Level 3 attainment	
	β	t	β	T	β	t
Sex	-.11	-2.78**				
Ethnicity (Māori)	-.10	-2.66**				
Decile	.15	3.66**	.27	7.95**	.18	5.13**
Employment			-.10	-3.24**	-.08	-2.50*
Occupation status	.08	1.97*				
Extraversion	-.10	-2.55*				
Conscientiousness	.12	2.61*				
Agreeableness	-.10	-2.23*	-.11	-2.78**	-.09	-2.14*
Neuroticism			.13	3.66**	.13	3.58**
Openness			.27	7.57**	.21	5.69**
Positive View of School	.10	2.39*	.10	3.06**	.11	3.09**
Verbal intelligence	.14	3.34**				
Mathematical intelligence	.26	6.23**	.19	4.83**	.23	5.70**
Critical reasoning			.16	4.15**	.15	3.76**
Self-regulation	.10	2.38*	.10	3.06**	.11	3.18**

* $p < .05$, ** $p < .01$

Structural Equation Model

The measurement variables of the latent constructs involved were used to develop three structural equation models. The three achievement variables were used as a criterion measure by constructing a latent achievement variable and making the three achievement measures dependent variables of the latent achievement variable. The other variables were included as predictor variables. For sex, home language, ethnicity and family structure, the dummy coded variables discussed earlier were included. The predictor variables can be divided up into four categories: genetic/biological variables, upbringing variables, attitudinal/belief variables and behavioural variables.

The genetic/biological category included the variables considered to be out of the control of the individual due to their genetic or biological basis. These variables are also considered to be relatively stable. This category included the demographic variables, personality variables and intelligence. Occupation was also included in this category because parental occupation has a socio-economic impact on the student and is outside their sphere of control. These variables were therefore considered to be causally prior to the other variables.

The upbringing variables were employment and decile. They were considered to be antecedents of parental socio-economic status. The link between socio-economic status and student employment has been previously discussed. It can also be reasonably considered an antecedent of parental occupation because the level of socio-economic status of the occupations an individual can reasonably

hope to hold is most likely determined before the individual even has children, let alone the children reaching an age at which they begin to consider after-school employment opportunities. Likewise, decile is considered an antecedent of occupation because the decile calculation is partially based on the socio-economic status of the families of students who attend that school.

The attitudinal/belief variables consist of the four attitude scales (entity theory of intelligence, view of school, education pays, and parental involvement), and the behavioural scales were the four study strategies. These two categories were considered to be antecedents of the genetic/biological variables and the upbringing variables. While the relationship between underlying variables such as personality and less stable variables such as attitudes or use of study strategies appears clear-cut, the relationship between attitudes and behaviours is more difficult to determine. While it is understandably possible for an individual's attitude to affect their behaviour (E.g. education doesn't pay off and so I'm not going to waste my time studying), it is also possible for an individual's behaviour to affect their attitude. Thus, the attitudinal variables and study strategy variables were initially included in the model as causal equals.

Paths were constructed between each of the variables. Each of the non-statistically significant paths was then eliminated, as were variables without significant links to other variables, or which were not part of a path that linked to student achievement. For variables considered to be causally equal (attitudes/beliefs and study strategies), paths were constructed in both directions, and the weaker path

eliminated. This resulted in a model in which the remaining attitude variables (education pays and view of school) were placed causally prior to the only remaining study strategy, self-regulation.

The result of the model for all participants is shown in Figure 1. All estimated factor loadings were significant at $p < .05$. Standardised path coefficients are shown on the arrows linking latent constructs. The model had good level of fit ($\chi^2 = 366.78$, $df = 96$, $p < .05$, RMSEA = .07, CFI = .921). This model captures the previously discussed results and causal pathways, and indicates the relative strength of their influence through the elimination of non-significant paths. The model demonstrates that many of the variables influencing student achievement are also causally related to one another.

A model specifically for male participants is shown in Figure 2 and a model specifically for female participants is shown in Figure 3. Both models had good levels of fit (Males: $\chi^2 = 130.84$, $df = 45$, $p < .05$, RMSEA = .07, CFI = .909; Females: $\chi^2 = 111.00$, $df = 44$, $p < .05$, RMSEA = .06, CFI = .935).

As previously stated, much of the research on achievement influences has considered a single variable or a small number of variables in isolation. These models are important because they combine the influence of a number of different variables previously studied, and allow conclusions to be drawn about the relative influence of each variable. This may suggest future directions to researchers for interventions designed to increase student achievement, and may indicate the

likelihood of success by showing whether the variable is a direct predictor of achievement, or whether past significant findings have been more likely due to a variable mediating, or being mediated by, another unmeasured variable. Specific findings in relation to these structural equation models are discussed below, and possible explanations for these relationships are outlined in the General Discussion, which follows.

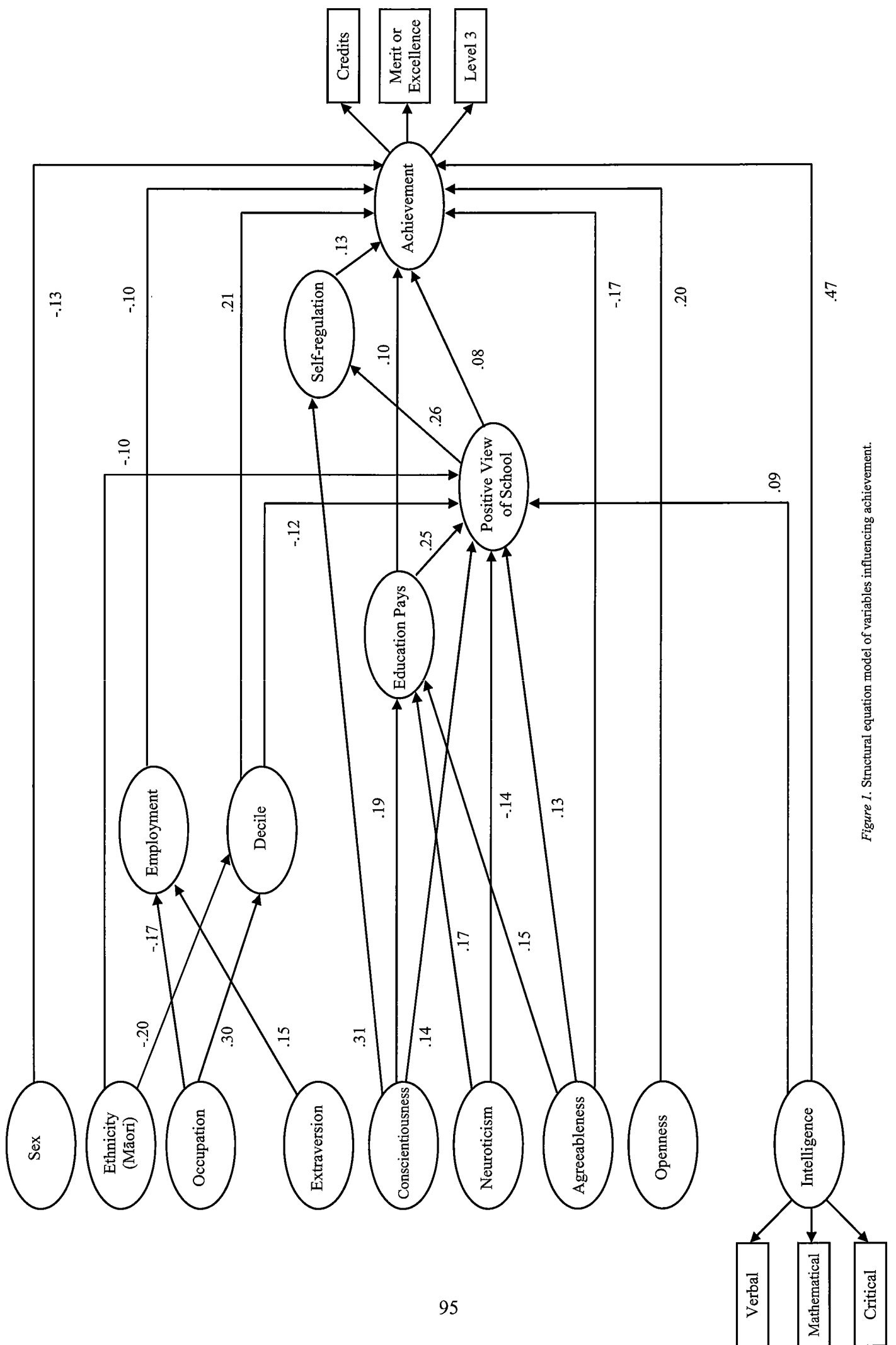


Figure 1. Structural equation model of variables influencing achievement.

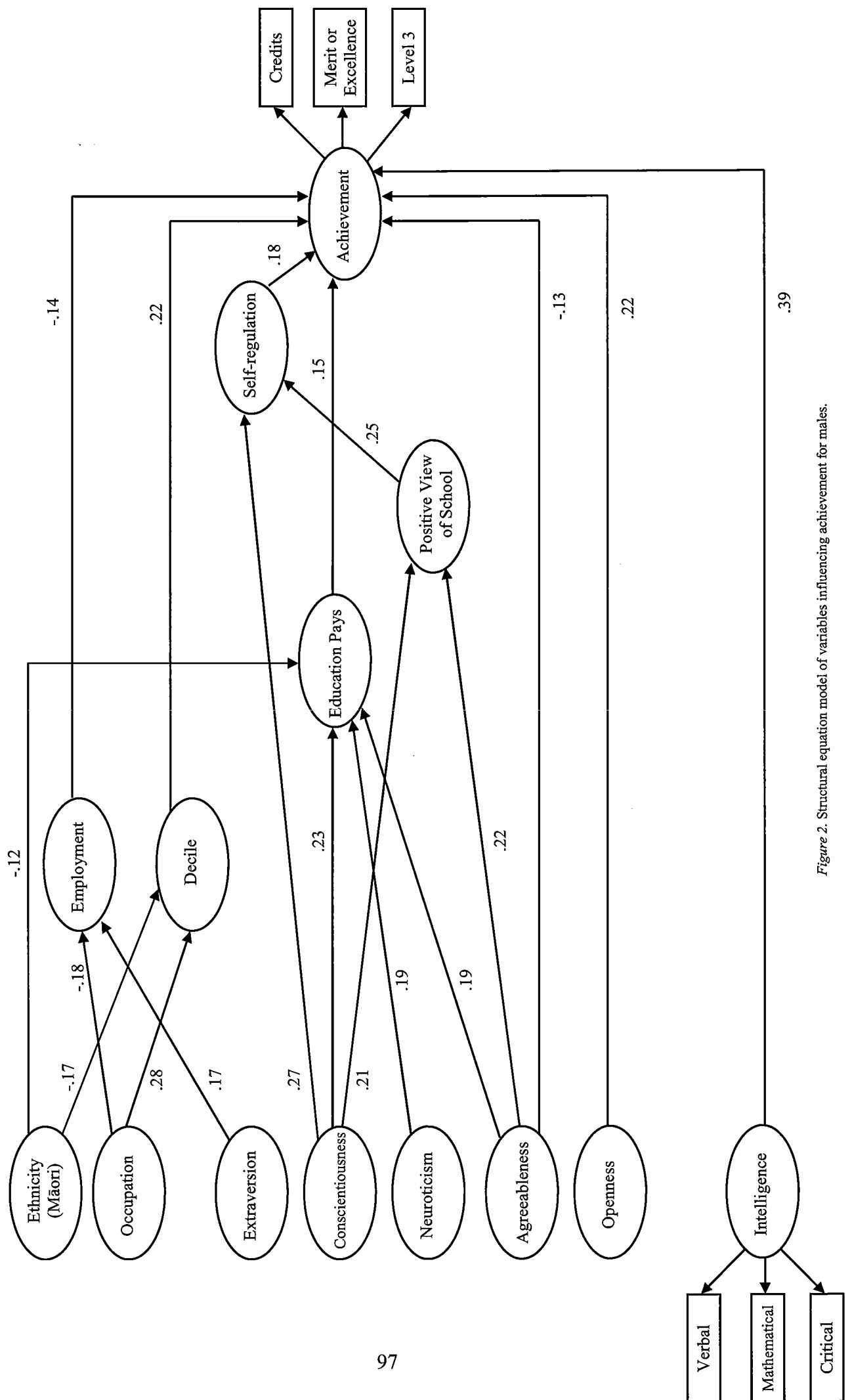


Figure 2. Structural equation model of variables influencing achievement for males.

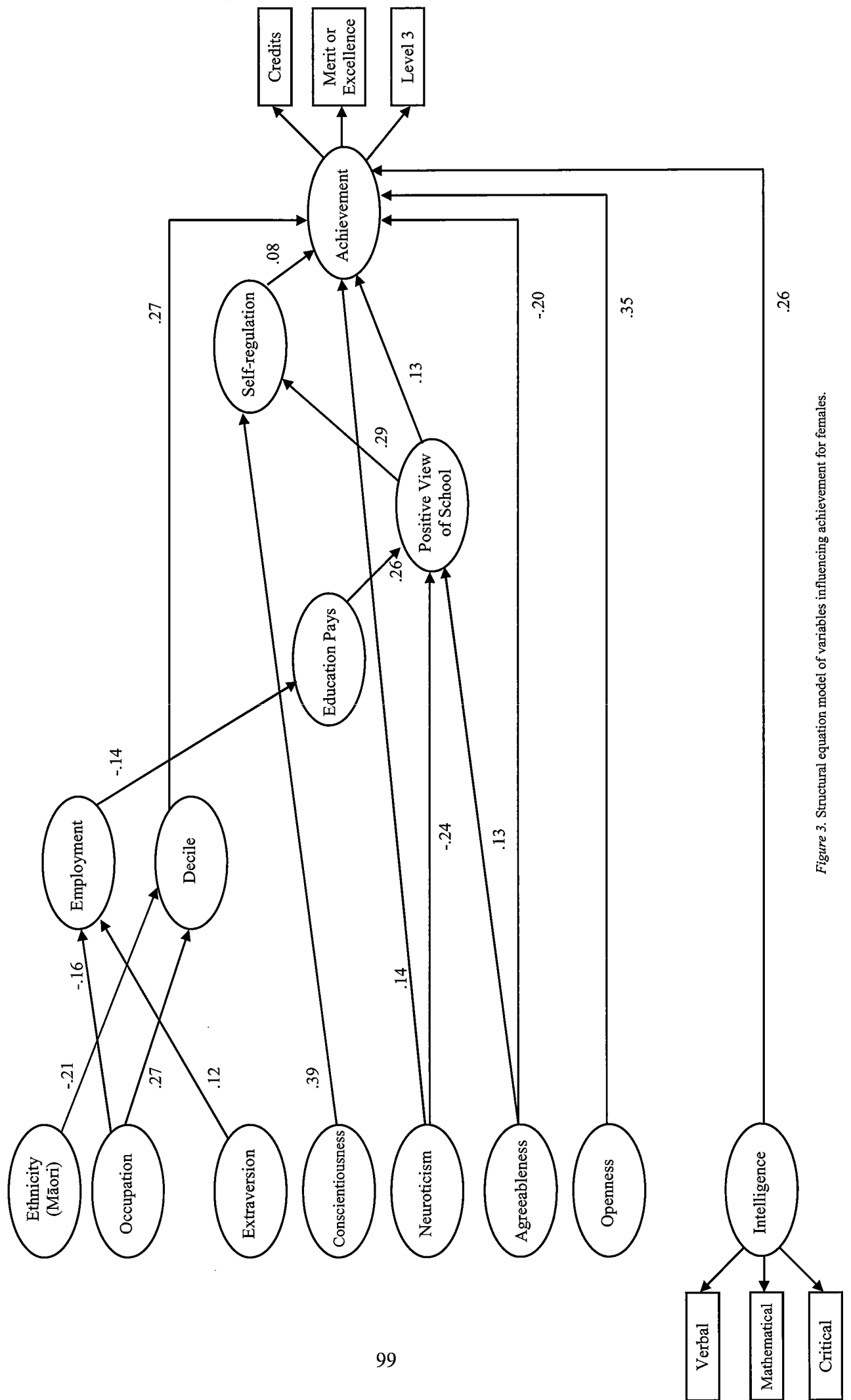


Figure 3. Structural equation model of variables influencing achievement for females.

Participant sex was not related to any of the variables other than student achievement. Whether or not a participant is Māori was related to attending a lower decile school, and having a more negative view of school, but was not directly related to achievement. However, when each sex was considered separately, the path between being Māori and having a negative view of school did not reach significance. For males, being Māori was linked to having a lower level of belief that education pays.

The increasing status level of the principal earner's occupation was related to lower levels of participant employment and attending a school of a higher decile, but was not directly linked to academic achievement. Likewise, increasing levels of extraversion were shown to be related to more hours spent in paid employment, but did not exert a direct influence on academic achievement. Increasing hours spent in paid employment negatively impacted on academic achievement, while attending a higher decile school positively influenced achievement. In contrast, participants attending higher decile schools tended to have more negative views of school. When the sexes were considered separately, there was no significant link between decile and having a more positive view of school for females, nor was there a direct link between employment and lower levels of achievement. Instead, increasing levels of employment for females was linked to having a lower level of belief that education pays. Intelligence was also related to view of school, and increasing intelligence was linked to increasingly positive views of school. Intelligence also exerted a strong positive influence on student achievement.

When each sex was considered separately, the path between intelligence and view of school did not reach significance.

Openness to experience and agreeableness were also directly related to achievement. Higher levels of openness to experience were related to higher levels of achievement, while higher levels of agreeableness were related to lower levels of achievement. Agreeableness related positively to view of school and believing that education pays, as did conscientiousness. Conscientiousness also positively related to the use of self-regulation strategies, but did not directly influence achievement. Neuroticism exerted a direct influence on both view of school and value of education. Contrary to the positive influence of conscientiousness and agreeableness, neuroticism exerted a positive influence on perceptions that education pays, but a negative effect on view of school. The two sexes differed slightly when the influence of personality was considered, with females having no significant link either between conscientiousness and the two attitudinal variables (education pays and view of school), or between agreeableness and the belief that education pays. For males, neuroticism was not linked to view of school, while for females it was not linked to a belief that education pays. However, neuroticism was directly linked to achievement for females, with higher levels of neuroticism linked to higher levels of achievement.

The economic value placed on education positively influenced participants' view of school, and was also directly related to achievement for total participants and male participants. View of school was positively related to self-regulation

strategies and directly influenced achievement for total participants and female participants. The use of self-regulation strategies also directly influenced achievement for both sexes and overall.

Interactions

The usual view of study strategies is that they are equally effective (or ineffective) regardless of the characteristics of the learner. However, there is little evidence to suggest that the application of study strategies has the same outcome for everyone. This section reports the effect of each of the study strategies on achievement outcomes based on the characteristics of the user. These interactions were analysed separately from the findings of the structural equation model, using the method described below.

Each of the continuous measures was dichotomised into low and high values by recoding scores depending on whether they fell above or below the scale mean. This dichotomization results in relatively conservative findings, as variables become categorical rather than continuous. The dummy coded variables described earlier were also included. This yielded 17 characteristics variables, as shown in Table 19. Factorial ANOVA was used to identify interactions between the distal variables (demographic variables, intelligence, personality, and attitudes and beliefs) and the use of study strategies in predicting achievement. Each of the variables was analysed for interactions with each of the four study skills, and with each of the three achievement variables (17 variables x 4 study strategies x 3 achievement variables).

Table 19

Variables Included in Interaction Analysis

Variable	Study Skill	Achievement Variable
Sex (1) Male / Female		
Ethnicity (2) Māori / Non-Māori	Critical Thinking	Merit and Excellence
Home Language (3) English / Other		
Family Structure (4) Nuclear / Solo		
(5) Employment		
(6) School Decile		
(7) Socio-economic Status	Critical Thinking	Merit and Excellence Level 3 attainment
Personality (8) Extraversion (9) Conscientiousness (10) Agreeableness (11) Neuroticism (12) Openness to Experience		
Attitudes and Beliefs (13) Entity Theory of Intelligence (14) Positive View of School (15) Education Pays (16) Parental Involvement		
(17) Intelligence	Critical Thinking	Merit and Excellence Level 3 attainment
	Self-regulation	Merit and Excellence Level 3 attainment

This was a very large number of analyses, and so only significant interactions are shown in Table 19. Of the 17 characteristics, only three had a significant interactive effect (Māori/non-Māori, socio-economic status and intelligence). This shows that study strategies are equally effective for most participant variables.

Analysis identified seven significant interactions. Six of the interactions were between the same characteristic variable and study strategy combination, but were significant for two of the achievement variables (proportion of Merit and Excellence credits attained and Level 3 attainment). The final interaction was significant for the proportion of Merit and Excellence credits. None of the interactions was significant for the number of credits attained.

Figure 4 shows the interactive effect of ethnicity and use of critical thinking scores ($F(1,650) = 6.61, p < .05$). Māori participants with low critical thinking scores had a slightly lower proportion of Merit and Excellence credits than non-Māori participants.

Using critical thinking skills had an academic advantage for non-Māori participants, but caused a large decrease in achievement for Māori participants. This result represents an increase of approximately 0.4 of the overall Merit and Excellence standard deviations for non-Māori participants, and a decrease of approximately 0.4 standard deviations for Māori participants (see Table 3). There was a significant main effect for ethnicity ($F(1,650) = 16.89, p < .05$), but no significant main effect for critical thinking.

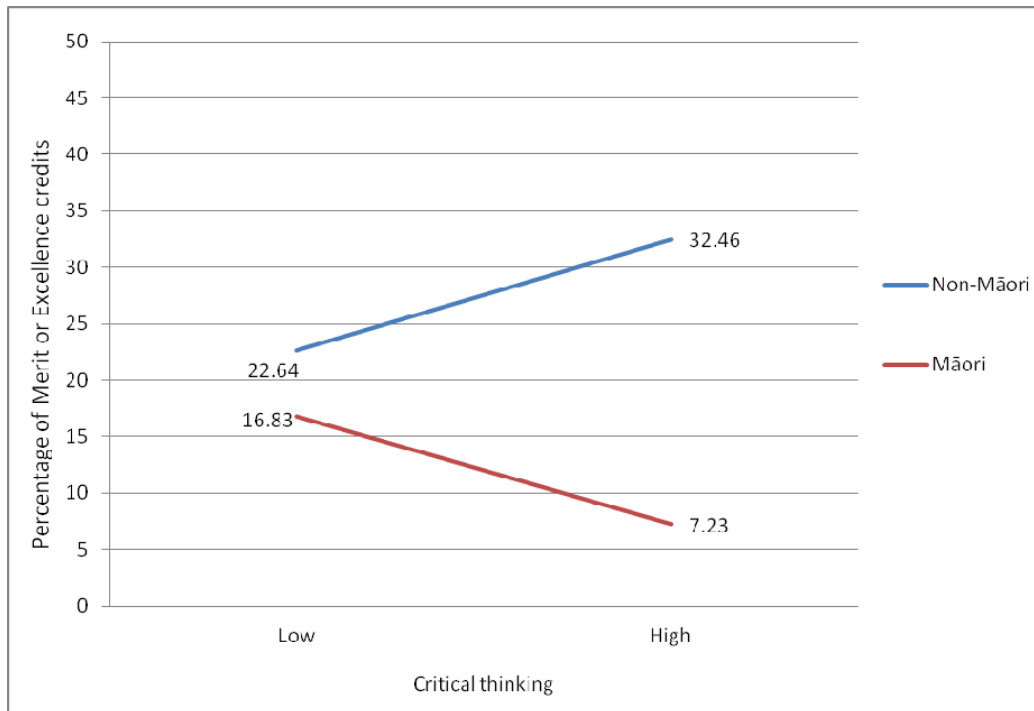


Figure 4. Merit and Excellence credit attainment based on participant ethnicity and critical thinking scores.

Given the relationship between being of Māori ethnicity and having lower socio-economic status, it was possible that the significant interactive effect of being Māori and the use of critical thinking skills was reflective of the interactive effect of socio-economic status and critical thinking (see Figure 5 and Figure 6). It would appear the finding is independent because being Māori is strongly related to attending a low decile school and yet a similar result was not found for decile and critical thinking. Furthermore, low socio-economic status diminished the effectiveness of using high levels of critical thinking skills. In the current interaction, being Māori and using high levels of critical thinking skills was not merely less beneficial, it more than halved the proportion of Merit and Excellence credits attained. As discussed previously, the current emphasis on critical thinking skills makes it imperative that further consideration is given to those students for

whom critical thinking skills are not positively related to achievement. This initial finding suggests that a continued classroom emphasis on critical thinking skills is more likely to decrease Māori achievement than increase it.

As stated, there was a significant interactive effect of socio-economic status and the use of critical thinking skills on both the proportion of Merit and Excellence credits (Figure 5) and Level 3 attainment (Figure 6).

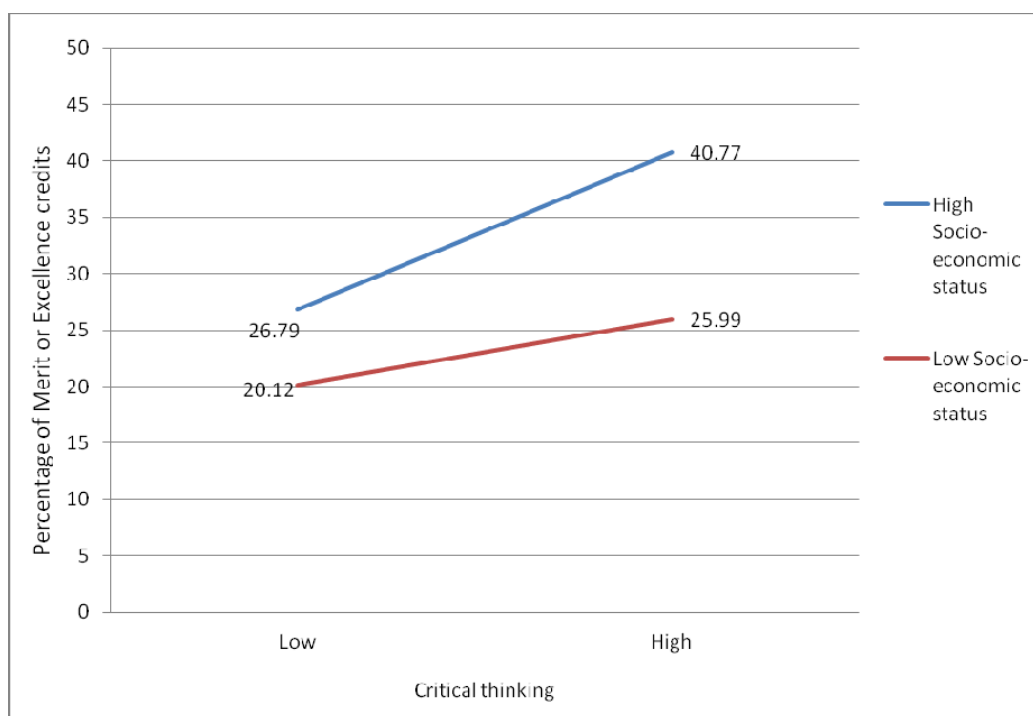


Figure 5. Merit and Excellence credit attainment based on participants' socio-economic status and critical thinking scores.

High socio-economic status participants had higher levels of attainment than low socio-economic status participants at both low and high levels of critical thinking skills usage. However, using high levels of critical thinking skills was more beneficial for high socio-economic participants than for low socio-economic

participants for Merit of Excellence credits ($F(1,536) = 4.00, p < .05$) and for Level 3 attainment ($F(1,536) = 7.97, p < .05$). These achievement gains for high socio-economic participants represent an increase of 0.6 of a standard deviation for Merit and Excellence credits, and 0.3 of a standard deviation for Level 3 attainment.

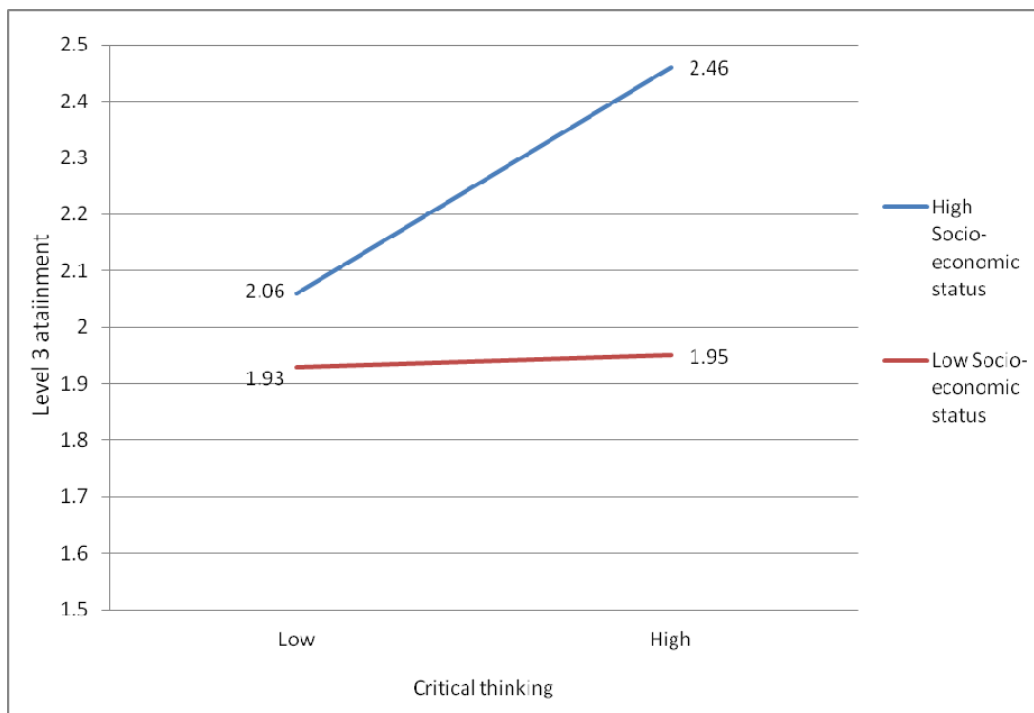


Figure 6. Level 3 attainment based on participants' socio-economic status and critical thinking scores.

This significant interactive effect suggests that high socio-economic status participants are better able to implement critical thinking skills effectively. It is possible that this is due to better parental modelling of study skills in the home environment. The socio-economic measure of occupation could be considered a proxy measure for parental education, given that level of education contributed to the framework used to code occupations (Davis et al., 1997). It is possible,

therefore, that participants with more highly educated parents/caregivers have more experience in applying these skills effectively. For example, they may have conversations with their parents in which their parents ask them to explain or justify their opinions. This would require a higher level of critical thought than an environment in which opinions were simply stated. There were also significant main effects for both variables on both achievement measures (see Table 20).

Table 20

Main Effects for Socio-economic Status and Critical Thinking

Achievement Variable	Variable	<i>F</i> score (1,536)	<i>p</i>
Merit and Excellence credits	Socio-economic status	28.04	.01
	Critical Thinking	24.07	.01
Level 3 attainment	Socio-economic status	21.86	.01
	Critical Thinking	9.50	.01

There was a similar finding for intelligence and critical thinking, which had a significant interactive effect for the proportion of Merit and Excellence credits attained ($F(1,650) = 7.20, p < .05$), and for Level 3 attainment ($F(1,650) = 9.38, p < .05$). Figure 7 shows the interactive effect for the proportion of Merit and Excellence credits attained, and shows that the use of critical thinking skills led to a greater increase in achievement for high intelligence participants than for low intelligence participants (0.5 SD for Merit and Excellence, and 0.4 SD for Level 3 attainment). For Level 3 attainment, the use of critical thinking skills led to a decrease in achievement for low intelligence participants (Figure 8).

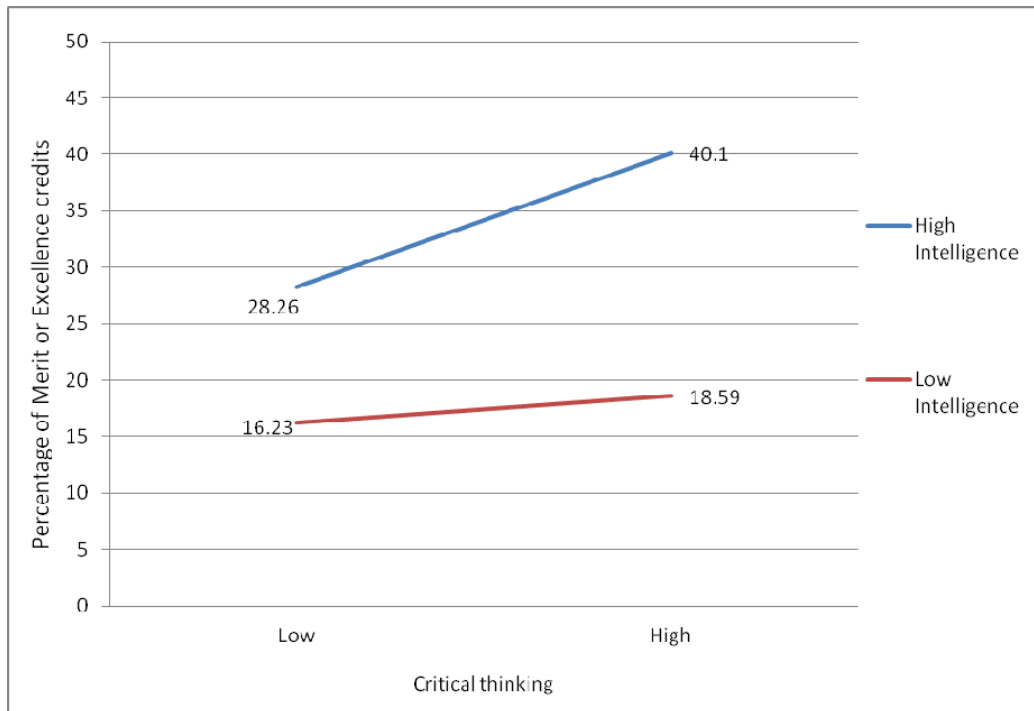


Figure 7. Merit and Excellence credit attainment based on participants' intelligence and critical thinking scores.

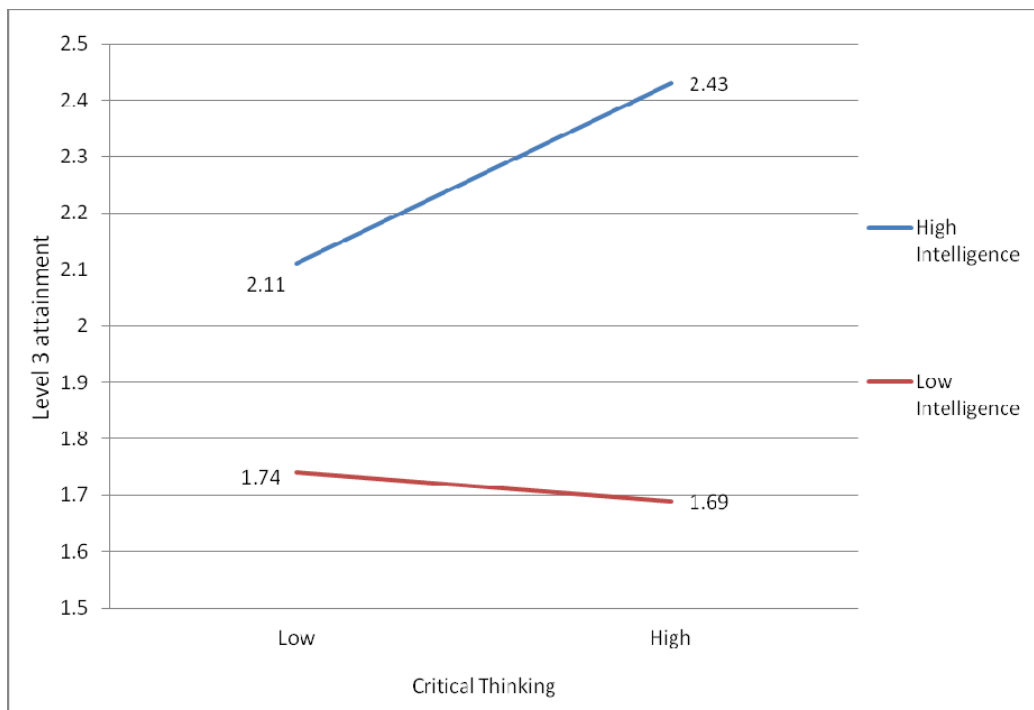


Figure 8. Level 3 attainment based on participants' intelligence and critical thinking scores.

This finding is consistent with critical thinking not being significantly related to the number of credits attained. The interactive effect of intelligence and critical thinking is consistent with previous findings relating intelligence and deep processing skills (Chamorro-Premuzic et al., 2009), as critical thinking is considered a deep processing technique. This indicates that critical thinking skills require a level of intelligence to be applied effectively, which has implications for the numerous critical thinking programmes and classes being taught in primary and secondary schools. This is particularly timely given that the revised New Zealand curriculum, which is currently being implemented, has thinking as one of its key competencies, and further describes effective thinking as ‘thinking critically’ (Ministry of Education, 2007b, p.10). There were also significant main effects for both variables on both achievement measures, as shown in Table 21.

Table 21

Main Effects for Intelligence and Critical Thinking

Achievement Variable	Variable	<i>F</i> score (1,650)	<i>p</i>
Merit and Excellence credits	Intelligence	90.17	.01
	Critical Thinking	16.13	.01
Level 3 attainment	Intelligence	82.57	.01
	Critical Thinking	4.87	.03

Intelligence had a similar interactive effect with self-regulation, with low-intelligence participants gaining little academic benefit from using high levels of self-regulation, and high intelligence participants showing a large increase in attainment. This was statistically significant for the proportion of Merit and

Excellence credits attained ($F(1,650) = 4.16, p < .05$), and for Level 3 attainment ($F(1,650) = 5.54, p < .05$). Figure 9 depicts the interactive effect for the proportion of Merit and Excellence credits attained, and Figure 10 shows the interactive effect for Level 3 attainment.

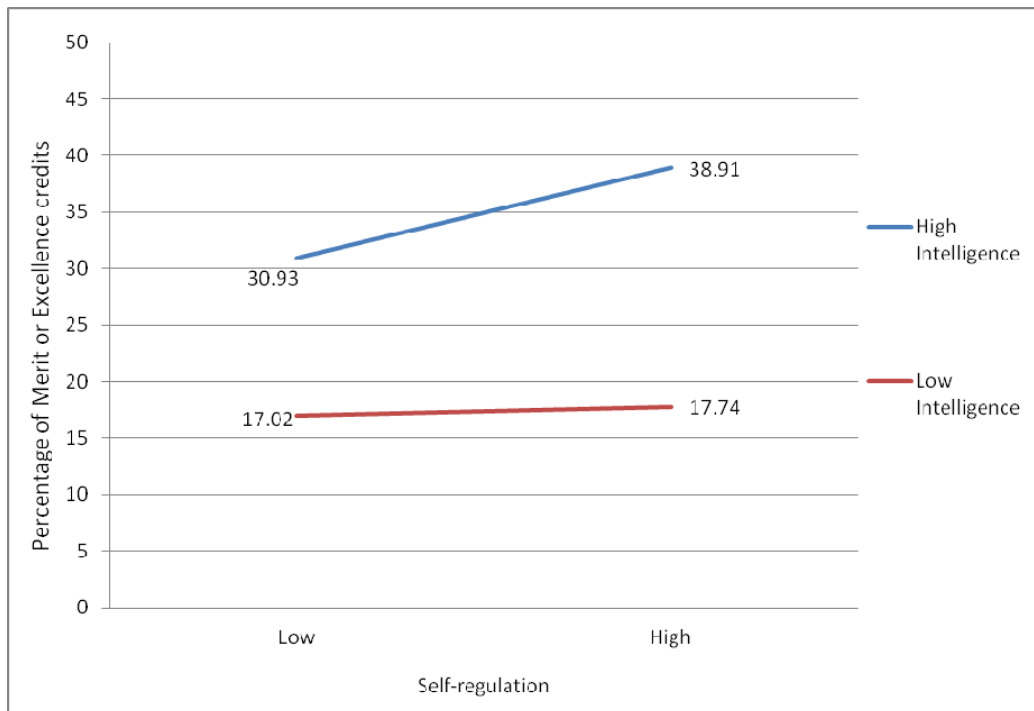


Figure 9. Merit and Excellence credit attainment based on participants' intelligence and self-regulation scores.

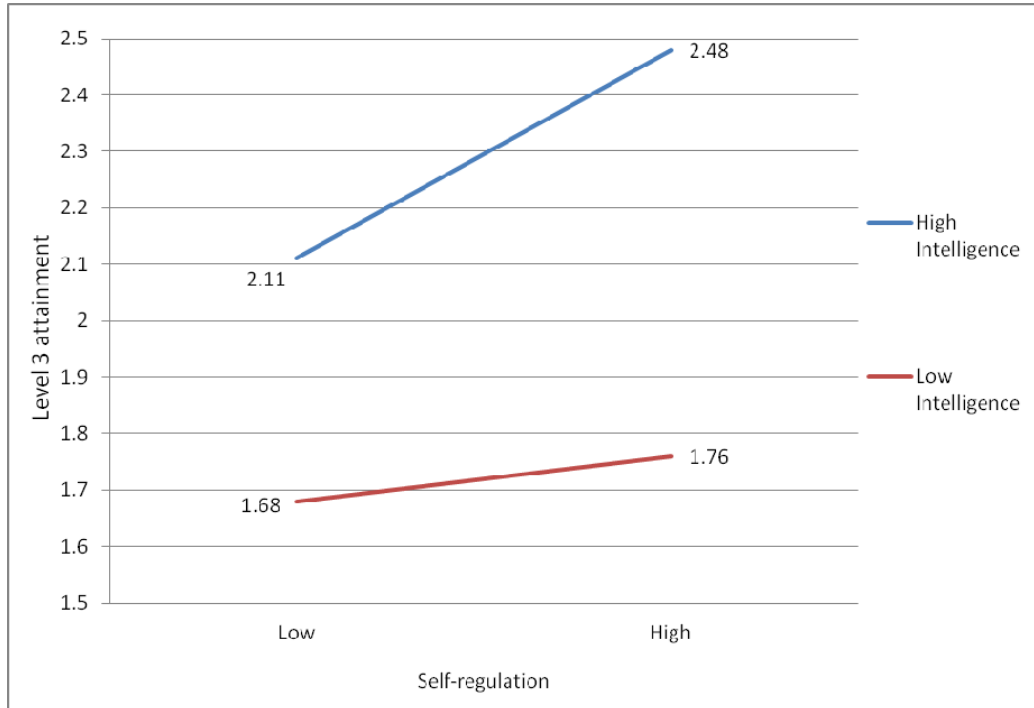


Figure 10. Level 3 attainment based on participants' intelligence and self-regulation scores.

There were significant main effects for both variables on both achievement measures, as shown in Table 22.

Table 22

Main Effects for Intelligence and Self-regulation

Achievement Variable	Variable	<i>F</i> score (1,650)	<i>p</i>
Merit and Excellence credits	Intelligence	97.18	.01
	Self-regulation	5.97	.01
Level 3 attainment	Intelligence	89.79	.01
	Self-regulation	14.12	.01

Discussion

Many of the variables shown to be the ‘big winners’ with regard to predicting student achievement would not be considered surprising. As expected, overall intelligence made the strongest overall contribution to predicting student achievement, and also had the strongest direct relationship with achievement in the structural equation models. Breaking down the measure into its subscales revealed that intelligence appears to be related to the achievement measures in different ways. Mathematical intelligence was the strongest predictor of achievement of all the variables considered. Regression showed that it was a significant predictor of all three achievement variables, and the strongest predictor of two of them. Verbal intelligence predicted the number of credits attained and critical reasoning predicted the other two achievement variables.

One possible explanation is that verbal intelligence is more akin to a measure of crystallised intelligence than the other two subscales, given that the questions required a broad existing knowledge of vocabulary. For example, the Wechsler Adult Intelligence Test uses verbal subtests as measures of crystallised intelligence and scales similar to the critical reasoning scale as measures of fluid intelligence. It is possible that verbal intelligence is related to a higher number of credits because attaining a large number of credits requires academic persistence rather than academic flair, perhaps similar to a student doggedly acquiring higher levels of crystallised intelligence. In contrast, measures of critical reasoning may be more akin to the critical and reflective thought required to achieve higher grades at a senior secondary level (Ministry of Education, 2007b).

There were two interactions between intelligence and the use of study strategies. The first of these was between intelligence and critical thinking skills. The interaction was significant for the proportion of Merit and Excellence credits attained, and for Level 3 attainment. It would appear that critical thinking is far more effective when applied by intelligent students than by students with a lower level of intelligence, which should lead to considerations of whether there are more effective strategies that less intelligent students should be applying, rather than an emphasis on a strategy that makes minimal difference to their achievement at this level. This relationship is further explored in Study 2, which seeks to influence critical thinking skills usage through a targeted intervention. It considers the effect of intelligence on both acquiring critical thinking skills and applying them effectively.

The structural equation models and regression analyses found that self-regulation was the only study strategy to predict student achievement. This increase was moderated by participant intelligence, with more intelligent students profiting more from increased use of self-regulation strategies than less intelligence students. This may be because more intelligent students have a greater return from academic investment than less intelligent students, and thus persevering with academic work leads to greater increase in achievement for this group. This relationship might also partially account for conflicting findings in the influence of self-regulation strategies on student achievement (Pintrich & DeGroot, 1990; Purdie & Hattie, 1999).

The integrated structural equation models of student achievement contain mainly variables considered to be fixed or relatively stable, such as intelligence, personality and some demographic variables. Given that self-regulation is one of the only variables in the integrated models that schools routinely attempt to influence, it is important that future research determines why self-regulation is more effective for more intelligent students than for less, and whether there is any way to make self-regulation strategies more effective for all students.

School decile was a strong predictor of student achievement, and was the strongest predictor of the proportion of Merit and Excellence credits attained. In the total structural equation model, decile was the strongest direct predictor of student achievement apart from intelligence. While it is a measure of socio-economic status, it was a stronger predictor of achievement than parent occupation, the student-level measure of socio-economic status. This finding about the predictive value of individual versus school-level measures of socio-economic status is consistent with previous findings (White, 1982). It therefore appears that measures of a family's socio-economic status may only be only important insofar as they are related to attending a school of a commensurate socio-economic composition. This may be due to the effect of being surrounded by a high-achieving peer group. One study found that the peer group effect was a significant predictor of academic achievement even after socio-economic status, sex and ethnicity were controlled for (Betts & Morell, 1999). Another study found that high achieving peers caused achievement growth in secondary school even

after controlling for the socio-economic status of both the school and the individual (Hanushek, Kain, Markman, & Rivkin, 2003).

Decile was negatively related to view of school, with students attending higher decile schools having poorer perceptions of school, although this relationship did not reach significance for female participants when considered separately. This differs from previous findings, with one study finding a small positive relationship between socio-economic status and a positive view of school (Huebner, Ash, & Laughlin, 2001), and others finding no significant relationship (Ainley et al., 1992; Karatzias, Power, Flemming, Lennan, & Swanson, 2002). However, these studies utilise individual level measures of socio-economic status, rather than a school-level measure such as decile. Individual socio-economic status was strongly related to school decile. The structural equation models showed that students of a higher socio-economic status were likely to attend schools of a higher decile. It is possible, therefore, that the resources and environment at school made students from lower socio-economic backgrounds view school more positively. While some of the items in the view of school scale were more oriented to academic content or learning, others were more general. It is also possible that variables unrelated to learning were influencing participants' responses. This study was conducted in late winter. Perhaps apparently unrelated factors such as the school buildings being warm and well-heated may have led to participants from low socio-economic backgrounds viewing school more positively than their higher socio-economic peers, for whom such features may not be considerations.

As there was no significant path between occupation and view of school in the structural equation models, it is possible that there is something about the particular low decile schools that participated in this study that resulted in students having a positive view of school or, vice versa, that there was something about the participating high decile schools that resulted in a negative view of school. Future research could consider asking students to elaborate on their ratings. For example, a focus group of participants could explain what aspects of their particular schools lead to the given ratings. It is possible that this finding was due to aspects of the participating schools that are independent of their decile ratings.

Openness to experience was a strong predictor of student achievement. It was (with decile) the strongest predictor of the proportion of Merit and Excellence credits attained, and the second strongest predictor of Level 3 attainment. Openness to experience had a strong positive relationship with measures of intelligence, which is similar to some previous findings (Ackerman & Heggestad, 1997; Austin, Hofer, Deary, & Eber, 2000). Conversely, the suggestion that openness to experience is related to achievement because of its relationship with intelligence is not supported by current findings. Rather, openness to experience showed incremental validity over measures of intelligence. Study 2 considers the malleability of openness to experience by including it in a targeted intervention which aimed to increase Year 13 achievement.

The predictive value of other personality traits was largely counter to hypotheses. Conscientiousness was a significant predictor of the number of credits attained,

which was consistent with hypotheses because of the requirement for academic persistence rather than aptitude. Similarly, conscientiousness was strongly related to self-regulation in the structural equation model, and also positively related to view of school and believing that education pays for male participants, and overall. Despite this, it was not directly related to achievement. This is not consistent with previous findings about the strong predictive value of conscientiousness (O'Connor & Paunonen, 2007; Poropat, 2009). Studies have found that conscientiousness had incremental validity over measures of intelligence (Di Fabio & Busoni, 2007; Poropat, 2009) and prior achievement (Wagerman & Funder, 2007). In the current study, the effect of conscientiousness was entirely mediated by other variables. This may suggest that studies which found a strong relationship between conscientiousness and achievement did not include the other variables included in the current study, and that conscientiousness was acting as a proxy measure for one of those variables, such as self-regulation, view of school or value of education, all of which are directly linked to student achievement.

Also counter to hypotheses, agreeableness was the next strongest predictor of achievement, and was directly linked to achievement in the structural equation models. This is not consistent with previous studies, which have found a very small positive relationship between agreeableness and achievement (O'Connor & Paunonen, 2007; Trapmann, Hell, Hirn et al., 2007). The zero-order correlations between agreeableness and each of the three achievement variables are more consistent with prior findings, as agreeableness did not correlate significantly with

any of the three variables. Agreeableness related positively to value of education and view of school (for males and overall), but was negatively related to achievement for each of the three achievement variables. While this is not consistent with meta-analyses of multiple studies, it is consistent with the findings of some individual studies. One study found a strong negative relationship between agreeableness and achievement, and a strong positive relationship between neuroticism and achievement (Diseth, 2003). This finding is also consistent with the results of the current regression analysis, in which neuroticism was a significant positive predictor of all three achievement variables. It did not directly relate to achievement in the overall structural equation model, although it did relate positively to achievement for female participants. This suggests that the relationship between neuroticism and achievement may be more pronounced for females than for males. In the overall model, neuroticism related negatively to view of school, and positively to value of education. View of school would generally be expected to be a negative relationship, consistent with the negative affect associated with neuroticism (Costa & McCrae, 1980; Rusting & Larsen, 1997). This would also be expected to apply to value of education.

The final Big Five variable, extraversion, did not relate directly to achievement, attitudes or study strategies, but only had a direct relationship with the number of hours spent in paid employment. This may be due to aspects of extraversion that would attract extroverted students to employment, such as the ability to socialise well or the desire to meet new people, or it may be due to extraverted students making attractive employees in the type of low-skilled retail or hospitality jobs

typical of students in this age group. Employment was directly related to achievement and mediated the effect of occupation. Similar to agreeableness, extraversion was a significant predictor of the number of credits attained in the regression analysis, but did not have a significant correlation with the number of credits attained when measured separately.

Participant ethnicity was only a significant predictor for the number of credits attained. More specifically, being of Māori ethnicity was significantly related to attaining a smaller number of credits than not being Māori. While being of Pasifika descent was significantly related to lower achievement levels when considered individually, it was not a significant predictor when combined with other variables. When included in the structural equation models, ethnicity was not directly related to achievement, but was significantly related to decile, with Māori students more likely to attend lower decile schools. This supports previous findings that ethnicity is not significantly related to achievement once socio-economic factors are controlled for (Marie et al., 2008; Wylie, 2001).

There was also a relationship between being of Māori ethnicity and having a more negative view of school, which is consistent with findings suggesting that Māori students have lower levels of engagement in school than their non-Māori peers (Bishop, Berryman, Tiakiwai, & Richardson, 2003; Ministry of Education, 2008b). There was no causal relationship in the structural equation models between being Māori and having a low score on the education pays scale. This contradicts previous work by the original author of the education pays scale and a

subsequent adaptor, who both found that minority ethnicity students perceived the economic value of education to be lower than majority ethnicity students (Mickelson, 1990; Murdock et al., 2000).

Limitations.

Many of the limitations of this study have been discussed along with the variable to which they pertain. There are, however, some more generalised limitations to the study also. Firstly, the necessity to fit in with the host schools' arrangements for completion of the questionnaire led to small inconsistencies in the administration and completion of the questionnaire. For example, as previously discussed, some schools chose to have the briefing for the study completed on a separate day to the administration of the questionnaire itself. It is possible that there was more self-selection in these schools because students who did not wish to participate simply did not attend the questionnaire completion session. In other schools students who did not wish to participate had to either actively leave the room or find some way of occupying their time whilst their peers completed the questionnaire.

In practice, the vast majority of students who attended a separate briefing session also attended the completion session, as was the case in the joint session. Very few students chose to leave following the briefing part of the joint sessions, but a very small number chose to occupy themselves in completing the questionnaire in a manner contrary to that intended by the researcher. Four questionnaires were excluded from the study due to this reason. This suggests that the differences

between schools, while not ideal, did not create a marked difference in the self-selection of participants. Participants in joint sessions did not appear to feel more compelled to complete the questionnaires than participants in separate sessions. This limitation is avoided in the two following studies as both have a participant sample from a single source, which eliminates any possible inconsistencies caused by different settings.

A second potential limitation in the study was that students would be unwilling to invest the required cognitive resources in the intelligence subtests to generate a true measure of intelligence. The researcher considered it possible that participants would skip the intelligence test or answer only part of it. The researcher gave careful consideration before embarking on this project about how to adequately incentivise students to accurately and thoroughly complete a questionnaire of this length. The questionnaire required a significant level of cognitive investment from the students, and students were aware that the questionnaire would not contribute anything to their school grades. The size of the participant group meant that a financial incentive would have been both a large expense and impractical to administer. The large number of responses to each of the measures (ranging from 540 participants to all participants, with the majority of measures attracting responses from all participants) showed that participants submitted quality data.

After considering what would constitute an appropriate incentive to produce quality responses, the decision was made to produce comprehensive individual

profiles for participating students, on the grounds that they would incentivise both the students and the schools to participate in the study. These were four pages in length and were distributed to students after results were analysed. They were colour-printed and were placed in A4 sealed envelopes labelled with the students' name and the legend 'confidential'. Inspection of the completed questionnaires did not reveal any obvious 'half heartedness' in participants' responses, and intelligence scores did not correlate significantly with either conscientiousness or self-regulation, which would be the suspected correlates if students were not fully engaged in the completion of the questionnaire.

The profiles therefore seem to have been an effective incentive. Almost all were uplifted from the administrator at each participating school, and one small group of students who had truanted from the joint session visited their dean to ask how they could also get a profile written for them. Regrettably, these students received a detention rather than a profile.

Conclusion.

The current study produced an overall model of a number of variables previously shown to be associated with student achievement. By including a wide range of variables, conclusions could be drawn about the relative influence of these variables. Some variables previously hypothesised to be strongly related to student achievement did not add incremental validity over and above other measures. Rather, their effects disappear when other variables are included, which can be demonstrated by the number of variables that had significant correlations

with the three achievement variables, but did not significantly predict achievement in the regressions.

A somewhat disempowering aspect of these findings is that these variables whose effects ‘died away’ tended to be those more under the control of the student, rather than ordained by genetics or circumstance. For example, intelligence, personality and socio-economic status appear to be more important than student use of study strategies.

Given that research in this area is usually conducted in the hope that by better understanding student achievement educators will then be able to influence it, future research should consider the findings of the current research as a starting point for intervention programmes designed to increase student achievement. While past interventions have tended to focus on teaching students study strategies, the current findings suggest that this will do little to improve achievement, and that efforts would be best targeted towards influencing the variables shown to significantly relate to achievement at this level, such as openness to experience, which was directly and strongly related to student achievement in the current study. Study 2 reports the findings of a targeted intervention on a new sample of Year 13 students, and includes openness to experience among its target variables. Study 3 then reports on the findings of a study conducted with a subset of participants from the current study who progressed to university. This follow-up study allowed comparisons to be drawn about the relative influence of predictor variables in a different academic setting.

Chapter 5: The Effect of an Intervention on Achievement

The current study, Study 2, applied the findings of Study 1 to a new cohort of final year secondary students at a single secondary school. The primary objective was to explore whether conducting an intervention with these students would increase their scores on the target variables, and whether this would in turn increase their Year 13 achievement levels. Study 1 identified variables that were related to student achievement in Year 13. Two of these variables were chosen for inclusion in the current study, the first of which was a study strategy (critical thinking) and the second of which was a personality trait (openness to experience). Peer learning was not shown to be a factor in the first study, and thus did not relate to student achievement. It was chosen as the third variable in the current study so that it could act as a control. An increase in achievement for the peer learning condition would indicate that the intervention itself was causing the increase in achievement, rather than the specific variables studied. Participants in the study were randomly divided into three experimental groups, and each of the groups was assigned to an intervention targeting one of the three intervention variables: critical thinking, openness to experience, or peer learning.

Interventions

Principles and definitions.

There is a large body of research on the construction and delivery of study skills programs. One review of study skills interventions concluded that there were three important components to constructing a successful intervention: appropriate

motivation from learners, the strategic knowledge for doing the task, and a learning context that reinforces the skills being taught by the intervention (Hattie, Biggs, & Purdie, 1996). In the absence of any prior interventions based on personality type, the same principles were applied in the construction of the personality intervention in the current study. Students participated in the intervention voluntarily, and were able to stop taking part at any time across the eight month period of the intervention. Thus, students who voluntarily remained in the intervention were considered to be sufficiently motivated to learn. Participants were given strategic knowledge by explicit instruction in the target learning skill. Instruction was reinforced by giving participants the opportunity to practise the skills taught through workshop-based activities and through weekly follow-up messages.

One meta-analysis specifically focusing on the effects of study skills interventions on student achievement defined study skills interventions as ‘attempts to improve student learning by interventions outside the normal teaching context’ (Hattie et al., 1996, p. 99). The meta-analysis suggested that interventions depart from normal classroom teaching when they require an outside researcher to design and evaluate the intervention, involve a formal experimental design, and focus on teaching variables designed to increase academic performance (Hattie et al., 1996). The current study fits this definition as the researcher is not an employee of the school and the intervention took the form of workshops and follow-up messages. The workshops were held during school time, but outside the context of a particular curriculum area. The intervention was structured using a formal

experimental design, with experimental groups and a control group. There was the ability to evaluate the effectiveness of the intervention both through a post-intervention questionnaire and through changes in student achievement level from Year 12 to Year 13.

Classification and typical effects.

Interventions can be classified according to the SOLO taxonomy (structure of the observed learning outcome) (Biggs & Collis, 1982). According to this taxonomy, students progress in their learning through a hierarchical series of stages of increasing structural complexity. The first stage (prestructural) is not considered in this study as it describes students approaching tasks using irrelevant or inappropriate strategies. Interventions do not deliberately include strategies that are clearly unacceptable or inappropriate for the given situation or task (Hattie et al., 1996). The second stage in the SOLO taxonomy is unistructural, in which students are taught a single skill or technique to apply to a target task. This progresses to multistructural, in which students are taught several strategies or skills to apply. At this stage, such strategies are not integrated and so students cannot make judgements about their relative effectiveness in particular contexts. The fourth stage is relational, in which the previously taught strategies are integrated so that students have increased discretion to decide which of the strategies would be most suitable in a given context. Finally, the skills are generalised to a new situation, which is called the extended abstract stage (Biggs & Collis, 1982). It is suggested that study skills interventions are more effective at the higher levels of the SOLO taxonomy (Hattie et al., 1996).

The current study aimed to progress through stages two to four of the SOLO taxonomy. Students were taught skills relating to the target strategy in the first workshop, and follow-up workshops focused on reminding students of these skills and practising ways to apply them. The second workshop aimed to shift the intervention to the relational stage, by first reminding students of the skills taught previously, and by then allowing them to practise applying those skills in novel situations. Students had the discretion to choose which strategies to apply in each situation. Follow-up messages progressed to providing students with more novel tasks and situations.

Interventions can also be categorised by the distance of transfer between the skills being taught and the outcome measure (Hattie et al., 1996). The current study had a long transfer distance because the formal outcome measures are a post-intervention questionnaire and a measure of overall achievement. Neither of these outcomes was introduced as part of the workshops or follow-up messages. Intervention programmes can also be classified as either reproductive or transformational (Hattie et al., 1996). The current intervention was classified as transformational as it was not intended to assist students to reproduce course content, but rather to process and *transform* content at a high cognitive level. Hattie et al.'s (1996) meta-analysis of interventions found lower outcomes for study skills interventions when programmes are transformational rather than reproductive ($d = 0.20$ and 0.71 respectively). It found a medium effect size ($d = 0.55$) for transformational interventions that were at the relational level of the taxonomy and used a distant outcome measure. It should be noted that this effect

size included interventions of six different types (including attribution-oriented and motivation-oriented). When relational study skills interventions with a distant outcome measure were considered in Hattie et al.'s (1996) meta-analysis, an effect size of 0.44 was found. The current study is only concerned with interventions specifically targeting study skills.

An earlier synthesis of meta-analyses found a typical effect size of 0.40 for educational interventions (Hattie, 1987; Hattie, 1992), and Hattie (2009) suggests that we should 'set the bar at $d = 0.40$ ' (p. 16) when assessing the effect of a variable on student achievement. Hattie et al.'s (1996) meta-analysis on interventions found a mean effect size of 0.45. However, this was achieved by averaging effects on student performance ($d = 0.57$), use of study skills ($d = 0.16$), and affect ($d = 0.48$). The current study did not contain an outcome measure of affect, but contains outcome measures of performance (NCEA achievement in Year 13 and achievement change from Year 12) and the use of study skills (post-intervention questionnaire data compared with pre-intervention baseline questionnaire data).

Previous findings on the effect of study skills interventions indicate that it may be difficult for the current intervention to leap the 'hurdle' of a 0.40 effect size on the use of the target skills given the average effect size of 0.16 (Hattie et al., 1996). Hattie et al.'s (1996) meta-analysis found that upper secondary students displayed large effects on their performance outcomes as a result of interventions, but negligible effects on their usage of study skills. This finding was supported by

Abrami et al.'s (2008) meta-analysis of critical thinking interventions, which found a small effect on critical thinking usage for upper secondary students. Each of these studies also found that the effect of interventions tended to be larger on student achievement than on measures of the study skill itself, which suggested that the current study might find an increase in student achievement for study participants even if use of the target skills did not increase.

Current Intervention

Critical thinking.

Critical thinking was one of the two study skills variables in the current study. As discussed in Chapter 2, critical thinking can alternatively be called deep learning, deep processing or elaboration (see Abrami et al., 2008, for a detailed review of definitions and theories on the content and structure of critical thinking). Critical thinking has been linked to higher levels of achievement in a number of studies (Diseth, 2003; Purdie & Hattie, 1999). In Study 1, critical thinking skills had the strongest correlation of the four study strategies assessed with the proportion of Merit and Excellence credits attained, and the second strongest correlation with Level 3 attainment. Abrami et al.'s (2008) meta-analysis of interventions targeting critical thinking skills found a medium effect size on the use of critical thinking skills.

In addition to differing definitions of critical thinking, there is a lack of agreement as to whether critical thinking is a subject-specific skill and should therefore be

taught as part of a particular discipline (Sá, Stanovich, & West, 1999), or a generic skill, and thus should be taught in specific critical thinking classes or courses (Smith, 2002). The specificist view is that thinking and reasoning are always linked to a specific domain (McPeck, 1981). In contrast, the generalist view asserts that critical thinking is a core set of skills that, once developed, are readily transferable to different contexts or subject domains (Siegel, 1988). If the current intervention is effective in raising student achievement for the critical thinking group, that offers support to the generalist theory.

Critical thinking was chosen primarily because of the interaction between intelligence and the use of critical thinking skills found in Study 1. The interaction suggested that higher levels of critical thinking skills are effective in increasing achievement levels for students with high levels of intelligence, but that gains in achievement are negligible for less intelligent students. A number of possible reasons for this were discussed in Chapter 4. The current study should not only demonstrate whether the intervention increases use of the target skill, but also allow inferences to be drawn about relative increases for low and high intelligence groups. In addition to measuring an increase in target skills, conclusions are drawn about the value of this increase in terms of increased student achievement for the experimental group as a whole, and for low and high intelligence participants as subgroups.

Study 1 found that intelligence was strongly related to increased student achievement, with each of the three subscales of intelligence significantly related

to at least one of the achievement variables. Previous findings have suggested that interventions are more effective for low- and medium-ability students, and are less effective for high ability students (Hattie et al., 1996). Indeed, in Hattie et al.'s (1996) study, high ability students only benefited from two of the six interventions examined; study skills interventions were not one of these. It is possible that this finding is because of ceiling effects in the achievement levels of highly intelligent students. Another possibility that Hattie et al. (1996) hypothesised was that these high-ability students may perceive less need to change their usage of study skills given that their previous use of study skills has been successful in the past.

Given the findings in Hattie et al.'s (1996) meta-analysis, the finding in Study 1 that high use of self-regulation and critical thinking skills benefited high intelligence participants more than low intelligence participants is surprising. This indicates that an increase in the use of study skills should be more beneficial for high intelligence students than for low or medium ability students. The findings of the current study should demonstrate whether high intelligence participants appear less willing to implement the study skills taught than their lower-ability peers.

Openness to experience.

Overall, openness to experience was one of the two strongest predictors of student achievement in Study 1. It was the strongest personality predictor of both the proportion of Merit and Excellence credits attained, and the second strongest predictor of Level 3 attainment. These were the two achievement variables

suggested to reflect academic excellence. Openness to Experience was also directly linked to student achievement in the structural equation model. The influence of openness to experience on student achievement was stronger than that of any of the four study skills strategies. This is consistent with previous literature, which found that openness to experience has a strong positive effect on achievement in certain circumstances (Hattie, 2009). It was therefore included as a target intervention variable in the current study.

Because the intervention is designed to deliberately and systematically alter participant levels on the target variables, the inclusion of a personality variable leads to consideration of the nature of personality change and development. A large amount of research has been conducted in this area, and there are multiple viewpoints on both the stability and the malleability of personality over an individual's lifetime. These viewpoints can essentially be categorised into two opposing schools of thought.

The first of these is biological in origin and postulates that personality develops during childhood and adolescence and has become 'set like plaster' by the time individuals reach the age of 30 (Costa & McCrae, 1994; W. James, 1950). This 'hard plaster' hypothesis has been more recently revised to suggest that personality does not become entirely fixed, but that change continues at a decreased rate (McCrae & Costa, 1999). Hence, this theory is best described as a 'soft plaster hypothesis' (Srivastava, John, Gosling, & Potter, 2003). The second theory, the plasticity theory, suggests that personality remains plasticised, and

continues to develop and change across an individual's life in response to social roles and life events (Roberts, 1997). This theory focuses on the interaction between an individual's experiences and their personality, and suggests that individuals actively select and shape their environments (Srivastava et al., 2003). These environments and life experiences are hypothesised to shape their personalities in return (Roberts, Wood, & Smith, 2005).

A number of studies have identified normative changes in Big Five characteristics between the ages of approximately 18 and 30. These have been observed in multiple cohorts and across numerous cultural settings (see Roberts et al., 2005, for a list of studies). Individuals tend to increase in agreeableness and conscientiousness, and decrease in the remaining Big Five characteristics. However, researchers from the different theoretical perspectives have different attributions for these changes, with the plasticity theory suggesting they occur because of biological maturation (McCrae et al., 2000), and the plasticised theory suggesting they occur because of social norms and age expectations (Roberts et al., 2005).

Social investment theory provides one reason for why plasticity leads to personality change in late adolescence. The theory proposes that personality is prone to change due to individuals taking on social roles in which appropriate behaviour is rewarded and inappropriate behaviour is punished (Roberts et al., 2005). It is suggested that this transactional approach can tend to accentuate existing dispositions. One such study found that openness to experience predicted

involvement in the women's movement, and that involvement in the women's movement led, in turn, to increases in openness to experience (Agronick & Duncan, 1998).

The current study uses secondary school aged students as its participant group, and thus an increase in openness to experience post-intervention cannot be directly considered to support the plasticised viewpoint over the plaster viewpoint, as these viewpoints are more targeted to personality change over the age of 30. However, if the target personality variable is altered as result of the intervention, it lends support to the assumption that personality is altered through transactions with the external environment, thus indirectly supporting the plasticised viewpoint. Because the participants in the current intervention are at an age when both theories predict that comparatively rapid personality development is occurring, it is important to consider what personality changes are likely to take place over this time period. Personality trait consistency tends to be higher later in life, but is still reasonably high for comparisons from childhood to adolescence, and from adolescence to adulthood (see Roberts & DelVecchio, 2000, for a review of previous findings). There is evidence to suggest that openness to experience is prone to increase during adolescence (McCrae et al., 2002; Robins, Fraley, Roberts, & Trzesniewski, 2001).

One longitudinal study which considered openness to experience when participants were 16 and 18 years old found a small mean increase in this time ($d = 0.27$) (Pullmann, Raudsepp, & Allik, 2006). Another study conducted with first

and third year university students had a similar finding, with a small mean increase in openness to experience ($d = 0.34$) (Vaidya, Gray, Haig, & Watson, 2002). The current study assessed the participants at an interval of approximately eight months. It is likely, given the findings of previous studies, that little personality change will have occurred naturally during this time period. Naturally occurring personality change (whether biological or socially driven) can be identified by considering the change in openness to experience for all participants, rather than just participants in the openness to experience group. If all participants in Study 2 experience personality change on this variable, it suggests naturally occurring change. Additional change for the experimental group in which openness to experience is targeted would further indicate the malleability of openness to experience in response to the external environment.

Despite the differing viewpoints on the malleability of personality in response to external environments, the researcher has been unable to find any prior studies in which attempts were made to deliberately alter the personality characteristics of reasonably healthy, well-adjusted individuals. The only research on interventions relating to personality characteristics specifically relates to psychological or therapy-based interventions for participants suffering from either a physical or mental illness (e.g., Marchioro et al., 1996), or for pharmacological interventions (e.g., Knutson et al., 1998). Such interventions will not be discussed further as they deal with participant groups and intervention types that are not obviously applicable to the current study. Likewise, personality characteristics targeted for change in those interventions were generally targeted because of their pathology.

The current study does not assume that a low score on openness to experience is inherently detrimental to participants; rather it assumes that a high score may have academic advantages.

One researcher offers support for the active manipulation of personality traits, and suggests that as long as participants believe that characteristics can be changed, personality characteristics can be actively moulded (Dweck, 2008). Dweck's (2008) review summarised the results of several belief-based or skill-based interventions that resulted in changes to behaviours commonly used to measure the Big Five personality traits. For example, participants with an incremental belief about personal characteristics showed an increase in challenge-seeking behaviour, which is one of the lower order facets of openness to experience (Dweck, 2008). This lends support to the possibility that openness to experience could be increased through a targeted intervention.

Peer learning.

The third variable chosen for inclusion in the intervention was peer learning, which was included as a control variable. Study 1 included a measure of peer learning which was excluded during factor analysis, and was not therefore included in the regression analysis. It was chosen as a control variable in the current study because it was the only one of the initial study strategy scales that did not significantly relate to student achievement. This runs counter to previous findings that peer tutoring and cooperative learning environments have a moderate effect on student achievement ($d = 0.55$ and 0.41 respectively) (Hattie, 2009). In

contrast, it supports the finding that cooperative learning does not increase achievement unless there is a group-based reward attached (Slavin, 1997). An increase in the use of peer learning skills would suggest that the intervention has been effective in increasing the target skill. Because peer learning was not found to influence achievement in the previous study, an increase in achievement for the peer learning group in the current study may suggest that there is some other aspect of the study that is influencing achievement rather than the specific variables being taught.

Replication

At the outset of Study 2, participants completed a questionnaire similar to that completed by participants in Study 1. This allowed the researcher to offer a personalised profile as an incentive, which had proved a popular incentive in the first study. The collection of similar data to that in Study 1 also fulfils a secondary objective of the current study: a partial replication of Study 1. Achievement for the current cohort was tracked over the final two years of secondary school (Year 12 and 13) in order to ascertain whether achievement was lifted as a result of the intervention. This allowed prior achievement to be introduced as a variable in the study.

Method

Participants

Two hundred and fifteen Year 13 students at a single Christchurch secondary school completed the initial questionnaire. There were 111 males and 104 females. Following this, 175 of these participants elected to participate in the study skills portion of the study. Nine students withdrew from the study following their first workshop. 122 participants either attended the second workshop or communicated their wish to remain in the study. 84 participants completed the final post-measure. The small number of participants who completed the final post-measure was largely due to conflicting time demands during the final scheduled session.

Achievement Variables

The same three NCEA achievement variables were used as in the previous study: the total number of Level 3 credits attained, the percentage of credits (of those attempted) at a Merit and Excellence level, and the endorsement level of their Level 3 qualification. The New Zealand Qualifications Authority released NCEA results for the 215 students who completed the initial questionnaire. The school also gave permission for the release of Year 12 data, and for the release of Year 12 and 13 data for the previous year's Year 13 cohort so that inferences could be drawn about student progress in the current study.

Instrument

Students completed a questionnaire which was similar to the one students completed at the start of Study 1. This consisted of demographic questions and a number of scales. A copy of the questionnaire is attached as Appendix F. A number of scales from the original questionnaire were omitted for brevity. The scales that were retained were those that would be necessary for the intervention, those that were necessary for counterbalancing intervention groups, and those that were necessary to produce student profiles (as per Study 1).

The demographic questions appeared at the beginning of the questionnaire, followed by four of the five personality subscales. The intelligence scale appeared at the end of the questionnaire. This allowed questions that had the same response format to be grouped for ease of participant understanding. The demographic and intelligence sections had a range of multiple choice and free response formats, the personality scale was answered on a seven-point scale, and the remaining scales (attitudes and beliefs, openness to experience, and study strategies) were answered on a five-point Likert scale.

Demographic information.

The demographic information collected was sex, ethnicity, occupation of principal household earner, home language, family structure, and the hours the respondent spent in paid employment.

Personality.

Four of the personality scales used were the same as those in Study 1, which were the four three-item measures of extraversion, conscientiousness, agreeableness and neuroticism. One of the extraversion items was changed from ‘Extraverted/Introverted’ to ‘Outgoing/Shy’ due to some participants in Study 1 reporting unfamiliarity with the meaning of the terms ‘extraverted’ and ‘introverted’.

Because openness to experience is a focus of this study, and the reliability for the openness to experience scale used in the first study was only adequate ($\alpha = .56$), the scale was replaced with an eight item measure. The scale used was taken from the International Personality Item Pool (Goldberg et al., 2006; International Personality Item Pool, 1996). Goldberg et al.’s (2006) original scale comprised ten items, five of which measured higher levels of openness to experience, and five of which needed to be reverse scored. Two of the items (one negative and one positive) were about voting preferences (conservative or liberal). These two items were excluded on the grounds that a very small minority of participants in the study would have been of age to vote in the last general election (2008), and thus their responses would have been speculative rather than based on past behaviour. A sample item from the scale is *I tend to avoid philosophical discussions*.

Entity theory of intelligence.

The same three item scale was used to measure participants’ implicit theory of intelligence as in Study 1 (Dweck & Leggett, 1988).

Study strategies.

The four study strategy scales used were the scales identified by factor analysis in Study 1, each of which had an adequate level of reliability: time management ($\alpha = .85$), critical thinking ($\alpha = .84$), strategic skills ($\alpha = .84$) and self-regulation ($\alpha = .60$). The scales include items originally taken from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991), which was written for a tertiary setting. In the current study, the same amendments to items were used as in Study 1, to ensure their appropriateness for a secondary setting.

Peer learning.

The three peer learning items measured in Study 1 did not load onto any of the four study strategy factors, and were therefore excluded from the final scales. They were included in the current study to give a measure of peer learning for the student profiles and to give a measure of peer learning for pre and post-measure comparison. A sample item is *When studying, I often try to explain the material to a classmate or friend.*

Intelligence.

This 15 item scale measured students' verbal (5 items), mathematical (5 items) and critical reasoning (5 items) intelligence. It was based on the 21 item measure from Study 1, but two questions were removed from each scale. This was because the intelligence subscales took students in Study 1 a long time to complete compared to the other subscales in the questionnaire, and the time period for administering the questionnaire was restricted.

For the verbal and critical reasoning scales, the two items which had the highest proportion of correct answers in Study 1 were excluded. For verbal intelligence, this was two questions which required participants to insert a letter to form two words. These were answered correctly by 80% and 84% of participants. These questions were also among the questions that students asked for further explanation about during administration of the questionnaire in Study 1. The critical reasoning questions that were excluded both required participants to choose a figure that came next in a series. These both had a very high proportion of correct answers (89% and 88%). The mathematical scale had a lower mean than the other two intelligence scales in the first study, and so one question that had been answered incorrectly by a large proportion of participants (only 38% answered correctly) and one that had answered correctly by a large proportion of participants (92%) were selected for elimination.

Procedure

Initial questionnaire.

The researcher attended a Year 13 form period in the Year 13 common room. Participants were told about the content of the questionnaire and were given an envelope containing an information sheet, a consent form, the questionnaire, and a pen. A copy of the information sheet is attached as Appendix G and a copy of the consent form is attached as Appendix H. The students were told that if they elected to participate in the study by completing the questionnaire, they would be given a four-page individually written profile (as per Study 1).

They were also informed that they could choose to participate in a further part of the study in which they would learn more about a particular study skill, and would receive weekly tips and reminders pertaining to their assigned study skill. Student who consented to take part were asked to supply contact details of a text-capable phone or email account that they checked regularly.

Participating students completed the consent form and questionnaire, and then placed the completed form and questionnaire in an envelope, which they sealed and signed across the seal. This assured the students of the confidentiality of their results and minimised bias in students' responses by eliminating the possibility that their teacher or other school personnel may have access to their results. Each participating individual received a free pen and a four-page profile derived from their individual results. This had the same structure as the profile given to participants in Study 1 (see Appendix B for a sample profile).

Intervention structure.

215 students completed the questionnaire and all 215 students had provided contact details indicating their willingness to participate in the study skills section of the study. These students were randomly divided into three groups: openness to experience, critical thinking, and peer learning.

Group membership was then modified by shifting participants from one group to another to balance the three groups on their questionnaire scores on openness to experience, critical thinking, peer learning, intelligence and sex. The groups were

balanced so that pre- and post-measures of the target skills were less likely to be affected by floor or ceiling effects. For example, if the peer learning group already used a high level of peer learning skills, there is less potential for increase as a result of the intervention. The groups were balanced on the intelligence measure to lessen potential achievement ceiling effects due to the strong relationship between intelligence and achievement. This resulted in a group of 72 for critical thinking, 71 for openness to experience and 72 for peer learning. The group means and sex composition are shown in Table 23.

Table 23

Group Means and Sex Composition

Group	Critical Thinking		Openness		Peer Learning		Intelligence		Sex	
	M	SD	M	SD	M	SD	M	SD	M	F
Critical Thinking	3.43	0.66	3.78	0.69	2.81	0.74	8.29	3.30	39	33
Openness	3.33	0.67	3.71	0.73	2.96	0.74	8.51	2.85	37	34
Peer Learning	3.28	0.70	3.76	0.69	2.75	0.79	7.96	2.93	35	37

Each group was further divided into two to give a manageable size for student workshops, resulting in two groups studying critical thinking, two studying openness to experience and two studying peer learning. It should be noted that while the groups were balanced originally, some students attended workshops other than the one they were assigned to due to timetable clashes. Likewise, some students later chose not to participate in the intervention part of the study and thus did not attend their scheduled workshop. The intervention was delivered as two parts: two scheduled workshops, and follow-up messages.

Workshops.

Students were notified of the first scheduled study skills workshop through a notice in the school notices and a reminder sent to students' contact email address or a text to their phone number. The first workshop series took place in February 2009, in the third week of Term 1. Each first round workshop was one hour in length and took place during school time. Each workshop was run twice, once for each of the two groups assigned each 'strategy'. Students were subsequently sent follow-up messages, as described below.

The second workshop of each type was run in August, three weeks before practice examinations, which is traditionally a time of low engagement and attendance. Based on attendance at the first round of workshops, the second round workshops were run only once for each condition. Students who did not attend the second workshop were eliminated from the study, with the exception of students who expressed their wish to continue, either via contact directly with the researcher or through a follow-up by the Year 13 Dean.

Follow-up and general messages.

Follow-up messages were sent once a week to the designated email address or text-capable phone. While both media conveyed the same message, the words in text messages were often abbreviated to fit within the 160 character limit. The messages were sent during specified hours: on school days, messages began at 9am and finished at 9pm. On weekends, public holidays and school holiday breaks messages began at 11am and finished at 9pm. Messages were sent from a

pool of available messages for each experimental group. One pool of messages was active between the first and second workshop (February to August), and a second pool was active between the second workshop and the end of the study (August to October). This allowed the messages to be tailored to reflect the content of the workshop. Messages were sent from the available pool randomly, so that different participants received different messages at different times and during different weeks. This was intended to provoke conversation and imply that each student was receiving individualised attention.

Participants were not specifically told that the messages were sent using a software package designed for the purpose, as the researcher assumed that participants would automatically conclude this, from the sample size and the frequency of messages. Participants were told that they were not obligated to acknowledge or reply to messages.

All students in the study also received several general messages throughout the year targeted to specific events in the school calendar. These included messages prior to the school formal, examinations and term breaks. For example:

Hi NAME, Gabrielle the researcher here. Have a great holiday! Hope you stay warm and healthy! (sent on the last day of the winter school term).

Each student also received a message on their birthday wishing them a happy birthday (*Hi NAME, Gabrielle the researcher here. Happy Birthday! I hope you have a great day).*

Intervention content.

A) Critical thinking.

Workshop 1.

56 of the 72 students assigned critical thinking attended one of the two workshops in the first round. Participants were told that they would learn about critical thinking and elaboration skills. These were defined for them as:

1. **Critical thinking:** The degree to which independent thought is used to assess information and draw conclusions.
2. **Elaboration:** Strategies that are used to build connections between disparate ideas or items, and strategies that are used to identify and integrate further information.

Content.

Students participated in a whole-class activity in which a large picture had been covered by smaller rectangular tiles. The smaller tiles were removed one at a time to reveal part of the illustration beneath and students were encouraged to make judgements about the amount and quality of the information needed to make an accurate decision about the illustration beneath. This was then repeated with a second picture. The two pictures used were the Mona Lisa, and a panoramic photograph of Sydney harbour. The first picture yielded discussions about how some tiles revealed higher quality information than others (the Mona Lisa's face versus a portion of background), while the second photograph required more information, as none of the tiles individually revealed sufficient information.

The researcher then presented a Martin Luther King Jr. website that is maintained by a white supremacy organisation. Students participated in a small group activity in which they critically evaluated the information presented, and used prior knowledge to draw inferences about its veracity. Students then worked in pairs to solve a series of critical thinking problems, each of which was accompanied by a series of tips to add further information. This was followed by a Crime Scene Investigation scenario in which students evaluated the quality of clues provided and made decisions about ‘whodunnit’ based on the information provided.

Follow-up messages.

The follow-up messages covered both the practical strategies taught during the workshop, and also novel scenarios to which students would apply the critical thinking strategies taught. For example:

Think of yourself as a computer search engine. What strategies do you use to sort information in order of relevance/usefulness?

Think about why women’s clothes button from the left but men’s clothes button from the right.

Workshop 2.

35 students attended the second round critical thinking workshop.

Content.

The researcher introduced students to some common decision making biases about how judgments can be impaired, such as anchoring, prospect theory, and the

availability heuristic. These were discussed with reference to the students' everyday lives and their academic lives. Participants then considered possible ways to overcome these biases so that they could be more objective in their evaluation of material and information. Students then worked in small groups to complete a series of critical thinking puzzles based on '*The Da Vinci Code*'.

Follow-up messages.

Follow-up messages were grouped as per the previous messages, with practical strategies and novel scenarios. There were also some messages containing critical thinking puzzles or riddles. Example messages include:

Think about why animal rights activists target fur-clad women but not leather-clad bikers.

A man is six feet tall, is an assistant at a butcher's shop, and wears size 11 shoes.

What does he weigh?

B) Openness to experience.

Workshop 1.

58 of the 71 students assigned to openness to experience attended one of the two openness to experience workshops scheduled in the first round. Attendees were told that they had been assigned to learn more about reflective learning. Participants were not told that they were participating in a workshop to shift a personality trait as many may have believed that it was not possible to alter a personality trait or actively resisted possible adaptations.

Content.

Students completed a Trivial Pursuit style elimination round of questions about objects or places they are well acquainted with, such as the pictures on New Zealand bank notes. Students were asked to stand in a different section of the classroom to indicate their answers on the multiple choice questions. Example questions include:

While every New Zealand coin has a picture of the Queen, only one of our banknotes does. Which one?

The New Zealand flag depicts the four stars of the Southern Cross. What colour are the stars?

This was designed to demonstrate to students the ability to increase the information they get from everyday experience.

The 'reflective learning' cycle was then defined for students. This combined three of the six openness to experience subscales: feelings, actions and ideas (Costa & McCrae, 1992). The four steps of the cycle were: initial or new experience, reflection or observation (feelings), develop new concept (ideas), experiment or testing (actions). This can be seen as analogous to Kolb's (1984) experiential learning cycle.

Following this, the researcher demonstrated 'velcro learning', which illustrated the benefit of new experiences. The researcher used the following script to describe 'velcro learning':

This is sometimes called ‘velcro learning’. You know how Velcro is made up of a bunch of little hooks, which enable the other side of the velcro to stick onto those hooks. New information is the same. The more existing information or hooks you have to attach new information to, the easier it is for you to add new information, and the bigger advantage you have with existing information.

Students then participated in a demonstration with ‘kitchenalia’, which included common and unusual kitchen implements. In a version of a childhood game, the students were divided into two groups, and each group was given a covered tray. Students were told that once the covers were removed, they would have one minute to silently try to memorise the ten implements on their tray. After the trays were covered, they would have one minute to silently record as many of the implements as possible. Once students had done this, each implement was held up and named in front of the class and each participant scored their responses. Scores for each group were then compared. One group was given a tray with implements such as a fork, a spoon, a ladle and a potato peeler. The other group was given items which included a pineapple corer, a samosa maker, and an icing sugar duster. The group with the unfamiliar items performed very poorly compared to the other group. Students were told that academic learning was the same, and that trying to memorise unfamiliar information was a lot more difficult if they did not have a framework on which to ‘stick’ the information.

The researcher explained to the students that each person has a different comfort zone with regard to seeking out new experiences. Students participated in a taste

experiment in which they were required to measure their physiological arousal by estimating their level of salivation before and after eating a wedge of lemon. Some students experienced more salivation in response to the stimulation. Students were told that the same would be true of a situation like riding a roller coaster. Some of them would feel excitement, while others might feel fear or physical nausea. They then discussed academic settings that pushed their comfort zone, and discussed ways of extending their academic comfort zone.

Follow-up messages.

Follow-up messages concentrated on the first two steps of the ‘reflective learning cycle’: new experiences and reflection (feelings). Examples include:

Think about the lemon experiment and over the next few days try a food you’ve never tried before.

When you were younger, what did you want to be when you grew up? What was it about that choice which appealed to you?

Workshop 2.

43 participants attended the second round openness to experience workshop.

Content.

This workshop focussed again on observations, with a video activity and a practical demonstration with student volunteers. It also introduced two more of the openness to experience subscales: aesthetic and fantasy (Costa & McCrae, 1992). These two scales were explored during the second workshop because they

required more personal feedback and sharing from participants. The participants had received messages from the researcher in the interim and had had opportunities to ‘opt out’ of the study if they wished.

Students participated in an aesthetic activity in which they compared and contrasted four paintings of different aspects of the gardens of Giverny by Monet. The emphasis was on their personal observations rather than on critical or expert evaluations of the paintings. Students had the opportunity to explore their personal preferences and their different interpretations of the paintings in small groups.

The researcher then led an activity in which students were encouraged to use their imaginations to generate possible interpretations for a series of pictures featuring seemingly unrelated objects juxtaposed into a single frame. For example, pictures of a swimming pool and a table were interpreted as ‘pool table’, and a picture of a plant with an eye on it was an ‘iPod’.

Follow-up messages.

The follow-up messages reflected the more personal nature of the second workshop, and focussed more on aesthetics and fantasy than earlier messages. For example:

Pay attention to your dreams and think about what they might mean about events going on in your everyday life.

When you were a child did you draw with chalk on the footpath, build fortresses with Lego, or play with Play-Doh? Think about what attracted you to these activities.

C) Peer learning.

Workshop 1.

61 of the 72 students assigned to peer learning attended the first workshop.

Content.

Students participated in a small group brainstorming exercise to identify elements of peer learning. The researcher then introduced the concept of making choices about how to use peer advice or cooperation to enhance learning. This was illustrated by an activity where students had to solve a riddle in small groups by sharing and exchanging information that they had each been given. Some of the information was inaccurate (like some of information we obtain from others in real life).

Students then learned more about forming networks to enhance their own access to information and support in their peer relationships. They participated in a ‘six degrees of separation’ activity where they had to consider their own personal networks and how they could use those networks to locate a target person. This led into an activity in which students evaluated the qualities that they consider when forming different relationships.

Finally, students participated in a team work exercise named ‘Helium Stick’, which involved small groups of students cooperating to lower a bamboo stick to the ground whilst keeping it supported on one of each of the group members’ fingers. Students had to apply the skills they had learned to cooperate and share information to complete the task successfully.

Follow-up messages.

The messages varied between reminders of activities completed in the workshop and more practical ways of applying these tips. For example:

Think about qualities you look for in a friend. Which are universal and which are more personal to you?

In the workshop, some people said they preferred working in teams, and others preferred working alone. Which do you prefer and why?

Workshop 2.

26 participants attended the second round peer learning workshop.

Content.

Students completed an assessment that gave them more information about the roles they would be likely to take on when working within a team. They then participated in a small group discussion about the advantages and disadvantages of different roles, and how teams can compensate for missing skill sets. Students then completed a task in small groups and evaluated how their personal role tendencies and those of their group members affected their completion of the task.

Follow-up messages.

The follow-up messages involved tips and reminders for working effectively with other people. For example:

Sometimes groups may need to take risks to complete a task. Be prepared to support others in taking agreed, calculated risks, and try not to blame others if things go wrong.

Being assertive in a group situation means not being pushy and not being a pushover. Practice giving your opinions politely but confidently.

Post-test measure.

Participants.

The post-test measure was conducted in late October, which was as late in the school year as possible to allow the maximum time period for change in the target variables. However, this meant that some students had clashes during the scheduled session and only 84 students completed the post-test measure. 5 of these questionnaires were excluded because they were submitted by students who had not participated in the intervention section of the study. Participants received a chocolate bar as a thank you for their participation in the post-test measure.

Instrument.

The post-measure contained the scales that were measured during the first questionnaire and were worked on during the study skills intervention (peer learning, critical thinking and openness to experience). It also contained questions

about the workshops and follow-up messages. There were four questions measured on a Likert scale ranging from 1 (disagree) to 5 (agree), which asked students whether they found the workshops and follow-up messages interesting, and whether they believed they had learned a lot. There were also four short-answer questions asking for feedback about what students enjoyed about the workshops and follow-up messages, and suggestions for what would have improved the workshops and follow-up messages.

Procedure.

Students were notified of the post-measure session by way of a notice in the school notices, and with a reminder text message/email. The session was conducted during Year 13 form time in the Year 13 common room. As students arrived at the session, they were given the questionnaire and a pen. Students were told about the content of the questionnaire and were told the purpose of requiring their name on the questionnaire was to match the results of the study with the student's earlier results and the study skill they learned about. Students were told that their feedback would be used to improve the workshops and follow-up messages for future students, and were asked to be honest in their feedback so that the researcher could make necessary improvements. Students were given fifteen minutes to complete the questionnaire. As they completed it, they submitted the questionnaire to the researcher, and selected a chocolate bar from those available.

Results

Questionnaire Results

Table 24 shows the scale statistics for each of the scales in the initial questionnaire. Reliability is adequate for all scales except peer learning. This is unsurprising given that factor analysis did not identify a peer learning factor in the initial study. However, this measure was still used as a pre- and post-measure, although its low reliability places constraints on what can be meaningfully interpreted. The number of participants identifies the number of participants who answered every question measuring that construct. Very few of the participants missed more than a single question on a scale. Where a single question has been missed, the participant's mean score for that scale was calculated based on the lower number of responses and has been included in later analyses.

Table 24

Scale Statistics

Scale	M	SD	N	α
Extraversion	4.71	1.00	208	.65
Conscientiousness	4.91	0.98	211	.66
Agreeableness	5.56	0.98	212	.81
Neuroticism	2.98	1.08	212	.67
Openness	5.76	0.71	201	.76
View of Intelligence	2.47	0.95	210	.79
Time Management	2.30	0.91	209	.84
Critical Thinking	3.34	0.68	206	.81
Strategic Skills	3.24	0.76	207	.84
Self-regulation	2.90	0.74	210	.63
Peer Learning	2.95	0.73	214	.38
Verbal Intelligence	2.99	1.23	206	.66
Mathematical Intelligence	2.37	1.60	206	.74
Critical Reasoning	3.01	1.03	206	.52
Total Intelligence	8.37	2.97	206	.82

Intervention**Participants.**

Table 25 shows the number of participants at each stage of the study. Attrition rates were calculated by comparing the number of students who attended the first workshop with the number of students still participating after the second workshop. This included both students who attended the second workshop and students who were unable to attend the second workshop but requested to continue in the study. Because workshops were held during class time, students who missed classes but wished to continue in the study had conflicting class demands at the time of the scheduled workshop. There was also a scheduled

sports trip that some participants were away on. Overall, 30.3% of participants left the study during the year. This was higher for the peer learning condition (26 students, 42.6%) than for the other two groups, but the difference was not statistically significant ($\chi^2 = 1.27$, $df = 2$, ns). 14 students left the critical thinking group (25.0%) and 13 students left the openness to experience group (22.4%).

Table 25

Participants Included in Study

	Initial Groups	First Workshop	Second Workshop	Post- second workshop	Post- measure	Attrition
	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>
Critical Thinking	72	56	35	42	30	25.0%
Openness to Experience	71	58	43	45	26	22.4%
Peer Learning	72	61	26	35	23	42.6%
Total	215	175	104	122	79	30.3%

Participant impressions.

The post-measure questions pertaining to the workshops and follow-up messages were compared for each of the three groups, as shown in Table 26. Peer learning received lower mean ratings for each of the four questions compared to the other two groups. These ratings were comparatively much lower for participants' impressions of the workshops than for the follow-up messages. None of these mean differences were significant.

The scale ranged from 1 – 5, and so had a midpoint of 3. Each of the mean scores for whether participants found the follow-up messages interesting and whether they had learned a lot from the workshops were close to the midpoint, suggesting that participant views of the intervention were reasonably neutral. In contrast, the mean scores for whether they had learned a lot from the follow-up messages were below the midpoint, and they were above the midpoint for whether they found the workshops interesting.

Table 26
Comparison of Ratings for Different Groups

	Critical Thinking (<i>N</i> = 29)		Openness to Experience (<i>N</i> = 26)		Peer Learning (<i>N</i> = 23)		<i>F</i> value (2,75)	<i>p</i>
	M	SD	M	SD	M	SD		
Workshops: Interesting	3.79	0.77	3.46	0.86	3.26	0.96	2.56	ns
Workshops: Learned a lot	3.07	0.80	3.04	0.72	2.65	0.78	2.25	ns
Follow-ups: Interesting	3.20	1.26	3.15	1.08	3.09	1.20	0.06	ns
Follow-ups: Learned a lot	2.47	1.14	2.44	1.04	2.40	0.84	0.04	ns

Participants also gave a number of qualitative responses to the questions asking about positive and negative aspects of the workshops and follow-up messages. While there were responses unique to a single participant, many of the responses were repeated by multiple participants. With regard to the workshops, participants enjoyed the quizzes, the group work and the fact that many of the activities were interactive and hands-on. They found the workshops fun and enjoyed getting chocolate and pens as prizes and incentives.

In terms of improvements, the two most frequently mentioned ideas were that workshops should be more frequent and held out of class time. This is consistent with participants' ratings of how interesting they found the workshops. It is somewhat surprising that they recommended more workshops given that they gave a neutral rating to whether they had learned a lot from the workshops. Students found the follow-up messages entertaining and interesting to read. They particularly liked the follow-up messages that were riddles and had an actual answer. However, they thought that messages should have been less frequent, and found that some of them were hard to relate to their school work. Despite messages not being sent before 11am on weekend days or during the holidays, some students still felt that messages were sent too early.

Effect on target skills.

Participants completed a pre- and post-measure of each of the skills taught in the study. The results of each measure were compared for each of the groups. Only participants who had completed both measures were included in the analysis, so the participant numbers are lower than overall participant numbers in the study. Each group's results are shown for each of the three skills taught, in order to show whether other strategies were altered by the intervention rather than just the target skill. As shown in Table 27 - Table 29, there were no significant changes for any of the three groups on any of the measures. Analysis of covariance also did not identify any significant changes. A power analysis for each of the three groups using the previously discussed hurdle ($d = 0.40$) showed an adequate level of

power for the critical thinking and openness to experience groups (73.87% and 70.58% respectively), and low power for the peer learning group (35.40%).

Table 27

Comparison of Pre- and Post-measures for Critical Thinking Group

	Pre-measure (<i>N</i> = 29)		Post-measure (<i>N</i> = 29)		<i>t</i> value	<i>p</i>	<i>d</i>
	M	SD	M	SD			
Critical Thinking	3.44	0.63	3.42	0.60	0.13	ns	0.03
Openness to Experience	3.73	0.73	3.81	0.58	-0.49	ns	0.12
Peer Learning	2.71	0.82	3.07	0.80	-1.69	ns	0.45

Table 28

Comparison of Pre- and Post-measures for Openness to Experience Group

	Pre-measure (<i>N</i> = 26)		Post-measure (<i>N</i> = 26)		<i>t</i> value	<i>p</i>	<i>d</i>
	M	SD	M	SD			
Critical Thinking	3.26	0.70	3.40	0.76	-0.69	ns	0.10
Openness to Experience	3.67	0.77	3.78	0.58	-0.60	ns	0.16
Peer Learning	3.15	0.67	3.08	0.66	0.42	ns	0.11

Table 29

Comparison of Pre- and Post-measures for Peer Learning Group

	Pre-measure (<i>N</i> = 23)		Post-measure (<i>N</i> = 23)		<i>t</i> value	<i>p</i>	<i>d</i>
	M	SD	M	SD			
Critical Thinking	3.32	0.64	3.47	0.62	-0.89	ns	0.24
Openness to Experience	3.79	0.52	3.85	0.62	0.71	ns	0.11
Peer Learning	2.83	0.71	2.83	0.62	0.00	ns	0.00

The critical thinking group was then dichotomised into high and low intelligence groups by recoding scores depending on whether the score fell above or below the mean. As shown in Table 30, both groups had similar scores before and after the intervention. When critical thinking scores for each group were compared, there was no significant difference in usage between the two groups either before or after the intervention ($F(1, 54) = 0.16$, ns).

Table 30

Comparison of High and Low Intelligence Participants

	Pre-measure ($N = 14$)		Post-measure ($N = 14$)	
	M	SD	M	SD
High Intelligence	3.53	0.80	3.48	0.66
Low intelligence	3.36	0.44	3.31	0.53

Each group was then further divided by whether, as individuals, they had increased or decreased in critical thinking skills usage. Their Year 13 achievement was then compared with their Year 12 achievement. Table 31 shows the change in the proportion of Merit and Excellence level credits attained between Year 12 and Year 13. The decrease in achievement from Year 12 to 13 is typical of the whole participant sample. The table shows that there was a statistically significant difference between low and high intelligence participants who increased their use of critical thinking skills, with high intelligence participants experiencing an increase in achievement, and low intelligence participants experiencing a decrease.

Table 31

Change in Proportion of Merit and Excellence Credits

	Low Intelligence (<i>N</i> = 12)		High Intelligence (<i>N</i> = 15)		<i>t</i> value	<i>p</i>
	M	SD	M	SD		
Decreased in usage	-1.49	12.49	-10.06	15.40	-1.02	ns
Increased in usage	-15.79	14.75	2.57	7.79	3.06	.01

Effect on achievement.

The effect on achievement has been analysed using t-tests for dependent means and ANOVA. Similar to Study 1, the inclusion of three highly-correlated dependent variables assists in lessening the chance of type 1 error. Participants in the intervention had significantly higher levels of achievement than non-participants, as shown in Table 32. However, this may be due to the characteristics of students who chose not to participate initially or did not sustain their participation, and cannot be attributed to the intervention.

Table 32

Comparison of Achievement for Participants and Non-Participants

	Participants (<i>N</i> = 122)		Non- participants (<i>N</i> = 115)		<i>t</i> value	<i>p</i>	<i>d</i>
	M	SD	M	SD			
Credits	73.07	28.38	52.39	32.85	5.20	.01	0.68
Merit and Excellence	27.16	23.53	18.23	22.44	2.99	.01	0.39
Level 3 attainment	1.98	0.81	1.58	0.83	3.76	.01	0.49

In order to ascertain whether the intervention increased results for participants, the change in achievement level from Year 12 to Year 13 was compared for each group. Only participants who had attended the participating school for both their Year 12 and Year 13 years were included in the analysis. Participants generally decreased in the number of credits attained, which is consistent with national averages. Participants also tended to decrease in the proportion of credits that they attained at Merit and Excellence level, which is not consistent with national averages. The reason for this is that participants at the target school tended to perform better than the national average for schools of the same decile on the proportion of Merit and Excellence credits attained in Year 12 (26% compared to 23%), but performed worse than the national average in Year 13 (23% compared to 29%).

As shown in Table 33, there were no statistically significant differences for any of the three achievement variables. Both participants and non-participants tended to decrease in the number of credits attained, the proportion of Merit and Excellence credits, and the level of certificate attained.

Table 33

Comparison of Change in Achievement for Participants and Non-Participants

	Participants (<i>N</i> = 118)		Non- participants (<i>N</i> = 100)		<i>t</i> value	<i>p</i>	<i>d</i>
	M	SD	M	SD			
Credits	-23.06	20.67	-26.66	23.07	1.22	ns	0.17
Merit and Excellence	-2.95	13.68	-3.43	13.31	0.26	ns	0.04
Level 3 attainment	-0.31	0.59	-0.28	0.59	-0.31	ns	0.05

The achievement levels were then compared for each of the three experimental groups. As shown in Table 34, there were no significant differences in achievement for the three groups.

Table 34

Comparison of Achievement for Experimental Groups

	Critical Thinking (<i>N</i> = 42)		Openness to Experience (<i>N</i> = 45)		Peer Learning (<i>N</i> = 35)		<i>F</i> value (2,119)	<i>p</i>
	M	SD	M	SD	M	SD		
Credits	73.12	30.61	68.80	25.85	78.51	28.59	1.16	ns
Merit and Excellence	26.67	25.18	25.23	21.53	30.22	24.32	0.45	ns
Level 3 attainment	2.07	0.87	1.82	0.78	2.09	0.78	1.42	ns

The change in achievement from Year 12 was then analysed to discover whether one or more of the experimental groups had increased or decreased in achievement more than the others. Only participants who had attended the participating school for both their Year 12 and Year 13 years were included in the analysis. As shown in Table 35, there were no significant differences in achievement from Year 12 to 13 for the three groups.

Table 35

Comparison of Change in Achievement for Experimental Groups

	Critical Thinking (<i>N</i> = 41)		Openness to Experience (<i>N</i> = 43)		Peer Learning (<i>N</i> = 34)		<i>F</i> value (2,119)	<i>p</i>
	M	SD	M	SD	M	SD		
Credits	23.29	21.12	-25.42	20.45	-26.66	23.07	0.70	ns
Merit and Excellence	-2.48	1.49	-2.96	1.32	-3.51	1.33	0.05	ns
Level 3 attainment	-0.22	0.57	-0.42	0.63	-0.26	0.57	1.30	ns

The experimental groups do not appear to have increased in achievement compared to each other, or compared to non-participants. In order to be able to compare the experimental groups to a more representative sample than those students who opted not to participate in the current study, each group's achievement level was compared to the achievement of the 2008 Year 13 cohort.

Firstly, national averages were considered to see whether achievement levels at that decile nationally were different for the two cohorts (2008 and 2009 Year 13 students). National means for schools of the same decile to the school in the current study were used as a comparison. The average number of credits and the average proportion of Merit and Excellence credits attained was very similar for both cohorts for both their Year 12 and Year 13 years, as shown in Table 36.

Table 36

National Averages for Experimental and Comparison Cohorts

	2007 Year 12	2008 Year 12	2008 Year 13	2009 Year 13
Credits	77.09	77.67	67.74	66.18
Merit and Excellence	23.73	23.05	27.62	29.32

To overcome the small differences in averages, credits attained and the proportion of Merit and Excellence credits attained were converted to ratios by dividing each individual's score by the national average. The Year 12 ratio for each achievement measure was subtracted from the Year 13 ratio to give a measure of change in achievement which controlled for differences in national achievement figures for the two different years.

When all participants in the current study were compared to the control sample, there were no significant differences in achievement or in changes to achievement from Year 12 to Year 13 (absolute or standardised). Each of the experimental groups was then compared to the control sample, and there were no significant findings in either achievement differences or change in achievement for any of the groups on any of the achievement variables.

Participant responses.

An interesting and unexpected consequence of this study was the way in which participants interacted with the researcher. Despite participants being told they were not obligated to acknowledge or reply to follow-up messages, a large

number of responses were received. Some were in response to general messages, such as thanking the researcher for birthday wishes, or for ‘good luck’ messages prior to examinations. Evidence indicates that generally these messages were well-received, as the researcher’s message prior to the formal yielded three replies inviting the researcher to attend the formal also. One participant’s response to the question in the post-measure that asked for suggestions on improving the follow-up messages was *Birthday text – I didn’t get one*. This demonstrates that participants must have discussed the messages amongst themselves. As an aside, the participant was sent a post-hoc birthday message after the researcher read the post-measure feedback.

Some participants sent responses that answered the message sent, such as in the case of riddles or puzzles. For example:

Message: *Hi, ***. How could a cowboy ride into town on Friday, stay two days, and ride out on Friday?*

Response: *if his horse was called friday he could ride in and out regardless of what day of the week it was*

Message: *Hi, ***. Think about why sum shops hv 'Guide Dogs >Permitted' signs in their windows when neither the dogs nor their owners can read them*

Response: *Because they think theyre doing a good deed, and mindless consumers will think so too if they shop there*

When participants sent responses of this nature, these were acknowledged with a response thanking them, and giving feedback on their answer.

There were also number of general responses that appeared to assume a degree of familiarity. For example, despite the researcher always using her full name during workshops and in follow-up messages, many participants sent responses using abbreviated versions or other friendly terms. For example:

Should have come gabby! Was a blast! You saw our 'shorty star' then?

Good I gabs;-)

Thanks gabz

Cheers gabby babes! Youre a darling

Message: *Hi ***, Mix ur senses. How much does the colour pink weigh? How does vanilla scent sound?*

Response: *What ! ! ! ! ! Gabs your silly*

Message: *Lol! Guess that learning tip wasn't a good one 4 u!*

Response: *Pink doesnt weigh anything! Its an abstract concept gabs..It could weigh about as much as the brain waves that process it weigh..*

There were also responses that suggested that the participants viewed the researcher as a compatriot rather than in the role of a teacher. Despite the researcher conducting the study on site at the school and assuming the formal role of a classroom teacher during the workshop sessions, some responses indicated that the participants did not consider the researcher as being aligned with the

formal structure of the school. Many students sent responses with their own thoughts or comments, or that made their own learning tip suggestions to the researcher. Most were random and amusing, but some fell into the ill-advised category:

Message: *Hi ***, Try 2 change some1's opinion on a subject. Notice the arguments they find convincing & think of evidence u could provide.*

Response: *hi gabby, next time you're feeling a bit under the weather remember, a toke before school keeps you on the ball.*

Message: *Hi ***, When u look at ur class notes, think about the quality of the material & whether u find the info convincing.*

Response: *Learning Skills Tip 6: Ill almost certainly have forgotten that by the end of a holiday full of binge drinking*

Influences on Achievement

A partial replication of the first study was conducted by performing regression analyses using each of the three achievement variables as criterion variables and the remaining variables as predictor variables. Sex, ethnicity and family structure were dummy coded, which created one sex variable (male/female), one family structure variable (Nuclear/Solo) and one ethnicity variable (Māori/Non-Māori). Pasifika/Non-Pasifika was not included as an individual variable because of the small number of Pasifika participants (2 Pasifika students compared to 15 Māori participants). Total Intelligence was not included in the initial regression analysis because of singularity. These models accounted for 77.0% of the variance in

credits attained ($R^2 = .77$, $F(21,124) = 16.40$, $p < .05$), 80.0% of the variance in the percentage of Merit and Excellence credits attained ($R^2 = .80$, $F(21,124) = 19.59$, $p < .05$) and 77.4% of the variance in Level 3 attainment ($R^2 = .77$, $F(21,124) = 16.80$, $p < .05$).

Variables that were not significant at $p < .05$ were then excluded from the regression analysis to give the targeted regression results shown in Table 37. Six variables predicted 69.4% of the variance in credits attained ($R^2 = .69$, $F(6,163) = 61.65$, $p < .05$). Of these, the number of Level 2 credits attained in Year 12 was the strongest predictor ($\beta = .53$), followed by the proportion of Merit and Excellence credits attained in Level 2 ($\beta = .26$). Three variables predicted 77.6% of the variance in the percentage of Merit and Excellence credits attained ($R^2 = .78$, $F(3,166) = 191.49$, $p < .05$). The two strongest predictors were the proportion of Level 2 Merit and Excellence credits ($\beta = .69$) and Level 2 attainment ($\beta = .19$). There were also three predictor variables in the Level 3 attainment regression. These variables predicted 66.0% of the variance in Level 3 attainment ($R^2 = .66$, $F(3,214) = 138.73$, $p < .05$). All of the predictors were measures of prior achievement.

Table 37

Regression Results for Prediction of Achievement Variables including Prior Achievement Variables

	Credits		Merit and Excellence		Level 3 attainment	
	B	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Solo family	-.13	-2.85**	-.10	-2.58*		
Extraversion	-.10	-2.19*				
Conscientiousness	.15	2.73**				
Agreeableness	-.10	-1.98*				
Neuroticism						
Openness						
Verbal intelligence						
Mathematical intelligence						
Level 2 Credits	.53	7.44**			.22	3.20**
Level 2 Merit and Excellence	.26	3.78**	.69	9.73**	.44	5.59**
Level 2 attainment			.19	2.63*	.21	2.43*

* $p < .05$, ** $p < .01$

The regressions were then repeated excluding prior achievement variables. Five variables predicted 47.9% of the variance in credits attained ($R^2 = .48$, $F(5,144) = 9.89$, $p < .05$). Of these, conscientiousness was the strongest predictor ($\beta = .41$). Five variables predicted 25.6% of the variance in the percentage of Merit and Excellence credits attained ($R^2 = .26$, $F(5,180) = 12.41$, $p < .05$). The strongest predictor was openness to experience ($\beta = .29$). There were also five predictor variables in the Level 3 attainment regression. These variables predicted 28.7% of

the variance in Level 3 attainment ($R^2 = .29$, $F(5,144) = 11.59$, $p < .05$). The strongest predictor was conscientiousness ($\beta = .37$).

Table 38

Regression Results for Prediction of Achievement Variables excluding Prior Achievement Variables

	Credits		Merit and Excellence		Level 3 attainment	
	B	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Solo family	-.17	-2.27*	-.20	-3.02**	-.15	-2.05*
Occupation	.14	1.95*			.19	2.67**
Extraversion						
Conscientiousness	.41	5.14**	.17	2.56*	.37	5.02**
Agreeableness	-.20	-2.44*				
Neuroticism					.29	3.83**
Openness			.29	4.41**		
Verbal intelligence	.15	2.02*	.17	2.43*	.20	2.80**
Mathematical intelligence			.16	2.20*		

* $p < .05$, ** $p < .01$

Discussion

Intervention

The results suggest that the intervention had little effect on either the target variables or on student achievement. The measures of participants' opinions of the intervention showed no significant differences between the three groups. All three groups rated the workshops above the midpoint for how interesting they found

them, but at the midpoint for whether they learned a lot. They rated the follow-up messages at the midpoint for interest, but below the midpoint for usefulness. Participants in the peer learning condition gave the lowest ratings on all four of the intervention ratings questions. The peer learning condition had the highest attrition rate of the three experimental groups. This may initially indicate that students have a level of awareness about the strategies that influence their academic success, and that students did not view peer learning as an important influence on their academic outcomes. However, there are two qualifications that prevent this conclusion being drawn. Firstly, while ratings were lower, these results were not statistically significant. Secondly, because all workshops were conducted by the researcher, they took place during different school periods and on different days. Thus, it is possible that the higher attrition rate for the peer learning group was due to participants having extra commitments during those periods that did not affect the other groups in their different time slots.

The pre- and post- measures showed no significant increases for any of the three experimental groups on any of the three target variables. For the personality variable, openness to achievement, this result is not unexpected. The power analysis shows that a significant result would probably have been attained if a significant change had occurred. Both the plaster and plasticised theories suggest that personality change generally occurs over a longer period of time than the current intervention (Roberts & DelVecchio, 2000). In the current study, students were randomly assigned to the openness to experience condition, and had varying levels of that personality trait. Caspi and Moffitt (1993) propose that personality

change occurs in response to novel situations, but that change will only occur when there is pressure to behave, and when clear guidelines for adaptive behaviour are present. In the absence of guidelines for correct behaviour, they theorise that individuals will respond according to their existing dispositions. The current study placed participants in a novel situation, but participants were unlikely to have experienced strong pressure. Likewise, it is possible that guidelines for adaptive behaviour were not sufficiently strong to produce change. Furthermore, while participants may have responded to the intervention stimuli with more open behaviours, there was unlikely to have been sufficient pressure or behavioural guidelines to transfer these behaviours to other settings, hence leading to no significant difference from the baseline measure.

For the two study strategies, the lack of significant change was consistent with Hattie et al.'s (1996) meta-analysis of interventions discussed earlier, which also found little effect on the use of study skills as a result of intervention. Conversely, this finding is not consistent with Abrami et al.'s (2008) meta-analysis of critical thinking interventions, which found a medium effect on usage of critical thinking skills as a result of the intervention. It should be noted that the two meta-analyses employed different protocols for including or excluding studies in the analysis, particularly with regard to participant age, intervention duration and statistical content.

The current findings fall well short of the 0.40 'bar' with regard to usage of the target skills. The adequate level of power attained for the critical thinking group

suggests that it would be likely a significant result would have been found if the critical thinking group had reached or exceeded the 0.40 bar. There was a low level of power for the peer learning group. However, it was hypothesised that peer learning would only be significant if the other experimental groups were also significant. Thus, it was not expected that a significant change would occur for the peer learning group if none had been found for the other two groups.

As with openness to experience, it is important to consider the distant outcome measures employed to record change in usage of the target study skills. The pre- and post-measure questionnaires employed the same items asking participants to rate how strongly they agreed or disagreed with statements about strategy usage. Each of the study skills scales contained strategies that could be employed with different degrees of effectiveness. For example, the peer learning scale included the item *I try to work with other students from the class to complete assignments*. One can envision situations in which working with other students could lower productivity rather than increase it. Likewise, the critical thinking scale included items such as *When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence* and *When I read or hear a conclusion in class, I think about possible alternatives*. Feasibly, a participant may have viewed their agreement (or disagreement) with these statements to be unchanged when they completed the post-measure. However, the skills taught in the intervention may have meant that the participant's evaluation of what constituted good supporting evidence was far more thorough or sophisticated. Similarly, the strategies may have enabled the participant to think

of more or better quality, alternatives. Neither of these increases in the *quality* of usage would have been captured by the post-measure. This suggests that a near outcome measure should have been employed, such as an activity in the second workshop designed to measure participant usage of the target skills. Given that the aim of the intervention was to increase usage of the target skills across a participant's academic study, an intervention that was successful in changing behaviour according to a narrow and near outcome measure could not have been considered successful in the broader sense.

Similar consideration should be given to the post-measure of personality, as participants may not have been able to accurately assess their change on the scale. There is prior support for this possibility. One study found that participants completing two measures of attachment across the same time period as the current intervention (eight months) could not accurately recall their responses at Time 1 when their attachment style had altered in the interim (Scharfe & Bartholomew, 1998). Instead, the majority of participants who had changed in attachment style reported their original style as being the same as their response at Time 2. A similar study conducted with measures of the Big Five found that participants could not accurately assess their personality change, with a correlation of $r = .17$ between perceived and actual change on openness to experience (Robins, Nofle, Trzesniewski, & Roberts, 2005). For example, in the current study a participant may have agreed at Time 1 that they *carry conversations to a higher level*. At Time 2, they may continue to agree with this statement, but be unaware that they now comparatively carry conversations to a higher level than before.

The second distant outcome measure for this study was whether the intervention succeeded in increasing student achievement. When participant achievement was compared to the achievement levels of those who completed the initial questionnaire but either did not participate in the intervention or did not complete the intervention, participants had significantly higher levels of achievement than non-participants. When change in achievement from Year 12 to Year 13 was considered, participants did not have an advantage over non-participants. This suggests that the differences in achievement are due to the groups having different achievement levels due to some other factor rather than due to the effect of the intervention. One possibility is that the students who chose not to participate in the study are also less likely to engage with their academic work, leading to lower achievement levels.

This finding was further supported by comparing the experimental groups with a second comparison group: the previous year group of students. There was no significant difference in either achievement levels or change in achievement between the two groups. These findings show that the intervention was not successful in altering student achievement levels. For the two study skills variables, this finding is not consistent with the meta-analysis of study skills interventions that found a mean medium-sized effect on student performance as a result of interventions (Hattie et al., 1996). Given that the peer learning variable was included as a control, an increase in achievement for participants in that condition was not expected. However, the critical thinking group also showed no increase in achievement, which was counter to what was hypothesised.

In order to explore the interaction between intelligence and critical thinking, the critical thinking experimental group was further analysed in terms of high and low intelligence. Results showed no difference in usage between the high and low groups of critical thinking either at Time 1 or Time 2. Likewise, neither group showed an increase in usage in the post-measure. When achievement was analysed based on whether students in each group had increased or decreased in their usage of critical thinking skills, participants in the high intelligence group who decreased in their usage had a larger drop in achievement than participants in the low intelligence group. In contrast, an increase in usage led to a significant increase in achievement for high intelligence participants compared to low intelligence participants. This finding offers tentative support to the finding from Study 1 that more intelligent participants benefited more from the use of critical thinking skills than less intelligent participants. However, as the number of participants is very small, it is important that this finding be replicated with a larger sample.

The interactions with students through their responses to the follow-up messages assumed a degree of intimacy that was unexpected by the researcher. Because the initial messages in each exchange were computer-generated, this can almost be construed as a parasocial relationship, which is a relationship established with a celebrity or media character (Horton & Wohl, 1956). These relationships tend to strengthen over time (De Backer, Nelissen, Vyncke, Braeckman, & McAndrew, 2007), and people may eventually perceive the character/celebrity as a friend (Kanazawa, 2002). This was demonstrated by feedback on the post-measure, in

which one participant stated that a positive thing about the follow-up messages was that *They came at funny times and made me feel like I had more friends*. Such relationships can eventually end in parasocial breakups, such as in the death of a celebrity or the cancellation of a television show (Eyal & Cohen, 2006). This was demonstrated with the feedback on the post-measure *Thank you, it was fun - will miss the texts*.

Replication

The first regression analysis for the replication study demonstrated that prior achievement is valuable as a predictor of secondary achievement, which is consistent with previous findings (Hattie, 2009). The second regression analysis excluded prior achievement so as to be comparable to Study 1. When achievement was excluded, many of the results were similar to those of the first study, with the exception of measures not included in the current study. The socio-demographic variables (sex, ethnicity, employment and occupation) were less prominent in the current study, with only occupation represented. This was probably because of the smaller sample size in which participants were more homogenous in terms of ethnicity and socio-economic variables.

Extraversion was significant when prior achievement was included, but not when it was excluded. The remaining four personality variables continued to be significant predictors in the same direction as in Study 1. The finding that neuroticism continued to relate positively to higher Level 3 attainment adds strength to the results of Study 1, despite these being counter to the findings of

many previous studies. The influence of conscientiousness was much higher than in Study 1, with it being the strongest predictor for two of the three achievement variables. This is consistent with some previous findings on the strength of conscientiousness as a predictor (Poropat, 2009), but not consistent with Study 1.

Openness to experience remained the strongest predictor of all variables for the proportion of Merit and Excellence credits attained, which was consistent with Study 1. However, it was no longer a significant predictor of Level 3 attainment. This differs from Study 1 findings. These results, in addition to the results of the intervention, support previous findings from other researchers. As previously discussed, there has been much variation in results for the relationship between openness to experience and achievement for individual studies. The achievement variables it predicts differ in the current study from the findings of the first study. These findings suggest that openness to experience remains an important predictor, but has shown itself to be stable rather than malleable.

The influence of verbal intelligence in the current study was greater than in the last study, and the influence of the mathematical and critical reasoning scales had decreased. As in Study 1, at least one of the intelligence subscales was a significant predictor of each of the achievement variables in the current study.

Limitations

In addition to limitations discussed previously, the practical limitation that most affected this study was the difficulty in judging which students remained

participants in the study. Most interventions require active participation, and thus attrition is very clear. The period between the two workshops and between the second workshop and the post-measure only required the passive receipt of messages, making attrition difficult to determine accurately. The responses by some students to follow-up messages demonstrated ongoing participation, and showed a level of active engagement in the study beyond that required.

There were four face-to-face contacts during the course of the study (pre-measure, two workshops and the post-measure). Participants could miss the second workshop and the post-measure and still remain participants. Attendance was necessary for the pre-measure session, which collected baseline data, and the first workshop, at which the target skills were explicitly taught. Students who did not attend both of these had to be excluded because they had not completed a baseline measure or been introduced to their target skill. One possibility would be to include only participants who attended all four face-to-face sessions. This would have the advantage of clarifying participation, but would have increased attrition rates.

Judgements then had to be made about the second workshop and post-measure. Some participants could not attend one or both of these sessions, and yet expressed a wish to continue with the follow-up messages. Some participants attended all sessions and yet revealed in the post-measure that they had not received a number of the follow-up messages due to their contact details changing during the course of the intervention. It is impossible, therefore, to make a

decision about exactly which students can be classed as participants. Throughout this study, the rationale for decisions to this effect have been explained, but it is apparent that there are equally compelling reasons for defining participation in several different ways. Crucially, further analyses that applied alternative interpretations of participation were also conducted, and did not yield any statistically significant results. Ultimately, the fact that findings were not significant makes this a moot point, but it remains an important consideration for future studies of this nature.

A second limitation is that attrition made the experimental groups smaller, and thus decreased the likelihood of significant findings. It would have been possible to overcome this by only having a single experimental condition. This is not free of complications, however, because an increase in achievement could not be conclusively linked to an increase in the target skill if there were only a single experimental group. It could instead be interpreted as students improving on both outcome measures in response to the ‘individual attention’ they received as part of the study.

Further Research

Some possibilities for further research have been discussed previously, including replicating the study with a larger sample size. Given the intervention’s lack of success in achieving its aims, consideration should be given to the structure and delivery of replications, and to their target audience. Firstly, research indicates that an intervention may have been more effective with younger students (Hattie

et al., 1996). Hattie et al.'s (1996) study also found a negative effect for interventions over 30 days in length, so it is possible that the length of this intervention should also be considered.

It is also necessary for a balance to be struck between the practical and the ideal. The participating school kindly allowed students to participate in this study by missing their scheduled classes, but the scheduled classes continued to run in their absence. This led to some students being unable to attend workshops due to class commitments that they did not wish to miss. When students missed the first workshop for this reason, they were excluded from the study. The engagement level of these students in their program of study suggests they may have been ideal participants for the intervention. Thus, future studies of this type should aim, if possible, to replace scheduled classes rather than run intervention sessions concurrently with them, or to conduct the intervention sessions outside of scheduled class time.

One study suggests that in order for personality to be changed, participants must first have an incremental view of its malleability (Dweck & Master, 2008). Participants in the current study were not told that the focus was on a personality variable, in order to try to avoid resistance from entity theorists. However, a future study could include a measure of view of personality much like the view of intelligence scale in the current study (for an example scale, see Robins et al., 2005). This would make it possible to monitor whether change interacted with participants' views of the manipulability of personality. The current study did not

analyse change with reference to view of intelligence due to the small group sizes when introducing a third variable (experimental group x variable change x entity/incremental theory).

Conclusion

The findings of the current study offer little support for the malleability of personality through deliberate manipulation of the external environment. Likewise, there was little success in increasing the usage of the two study strategies included in the intervention. The intervention also failed to increase student achievement. This indicates that both study strategies and personality in upper secondary students are somewhat impervious to change, and that a successful intervention may need to be either more intensive, or more closely linked to a near outcome. For example, participants in the openness to experience workshop completed an exercise and received follow-up messages pertaining to art appreciation. An outcome measure that assessed whether their appreciation of aesthetics (a lower-order facet of openness to experience) had increased may have been more successful in identifying change.

Chapter 6: Influences on Achievement for First Year Tertiary Students

The current study is a longitudinal study of a subset of the participant group from Study 1. It extends the findings of Study 1 by exploring the value of different variables in predicting achievement in a tertiary rather than a secondary setting. As with secondary achievement, there have been a large number of variables studied with reference to academic achievement in a tertiary setting (for a detailed review see Evans, 1999). Participants in the current study represent a subset of the original participant cohort in Study 1. All of them participated in Study 1 in 2008 and were in their first year of tertiary study at the University of Canterbury at the time of this study.

As in Study 1, predictor variables can be categorised into demographic variables, personality variables, attitudes and beliefs, intelligence measures, and variables concerning the use of different study and learning strategies. The longitudinal aspect of the study and its two achievement data collection points allows prior achievement to be introduced as a variable.

The primary objective of the study is to determine both the individual predictive value and the relative predictive value of each of these variables on student achievement in the first year of tertiary study. The availability of data from the final year of secondary study for participants allows a second objective to be met. Findings in the current study can be compared and contrasted with those of Study

1, and conclusions can be drawn about the relative predictive values of variables not just in comparison to one another, but also in a different academic setting.

In order to enrol in a tertiary level course at the University of Canterbury, participants must have attained a University Entrance qualification. While over four hundred Study 1 participants attained a University Entrance qualification, only 178 enrolled as students at the University of Canterbury in 2009. Approximately one third of these students participated in this study, giving a sample size of 62 participants. Because the sample size is limited, statistical analyses in the current study do not mirror those conducted in Study 1. Likewise, discussion of results focuses only on variables for which analyses have been carried out.

The necessity for the current subset of participants to have attained a University Entrance qualification separates them from the original participant cohort in the area of attainment. Study 1 considered a large number of students, only some of whom would go on to attain the University Entrance standard. Thus, another objective of this study is to explore the way in which a subset of students who enrolled at the University of Canterbury differed in their characteristics from the cohort of 2008 participants who did not enrol at the University of Canterbury. Students at the University of Canterbury were chosen because it is the logical choice of university for Study 1 participants, and thus the majority of Study 1 participants who enrolled in tertiary study would be expected to attend the University of Canterbury. Furthermore, the researcher had the ability to access

contact information and student Grade Point Averages because the University of Canterbury's requirement that permission be given by an ethical clearance committee for the release of grades was met. It must be acknowledged that by restricting the study to the University of Canterbury, participants from Study 1 who enrolled at other tertiary institutions were not given the opportunity to participate. Likewise, restricting the study to the year immediately following Study 1 excludes those participants who may have opted for a short-term break from study, such as a gap year, but who may intend to pursue tertiary education in the future.

Achievement Variables

Tertiary achievement.

The University of Canterbury uses a system by which it converts the 'letter' grade that a student attains in each course to a numeric value ranging from -1 (E grade, or X grade, which is used when a student is found guilty of a disciplinary offence relating to academic dishonesty on that paper) to 9 (A+). The grade conversions are shown in Table 39.

Table 39

Grade Conversions for Calculating Grade Point Average

A+	A	A-	B+	B	B-	C+	C	C-	D	E	X
9	8	7	6	5	4	3	2	1	0	-1	-1

These numeric values are then multiplied by the course's weight, added together and divided by the sum of the course weightings to give an overall Grade Point Average (GPA) (University of Canterbury, 2010). This measure is a standardised measure of achievement that accounts for overall course load and individual course weightings, and is widely used and accepted both at the University and in other settings which require a measure of academic success, such as when applying for scholarships or graduate programmes. This is the achievement variable in the current study.

Secondary achievement.

The longitudinal nature of this study means that the Year 13 achievement information collected as part of Study 1 can be incorporated as a measure of prior achievement in the current study. The three achievement variables used in Study 1 (credits attained, percentage of Merit and Excellence credits attained, and Level 3 attainment) were incorporated in the current study as measures of high school achievement. Three meta-analyses that studied the value of final year secondary achievement for predicting first year tertiary achievement yielded correlations between .42 and .56 (Burton & Ramist, 2001; Schuler, Funke, & Baron-Boldt, 1990; Trapmann, Hell, Weigand, & Schuler, 2007).

A New Zealand study of the 2004 Year 13 cohort found a correlation of .39 between Level 3 achievement and first year degree-level course completion rates and found that Level 3 expected percentile was the strongest predictor of first year tertiary pass rates (Scott, 2008). Expected percentile differs from the measures

used in Study 1 as achievement variables, but this finding suggests that NCEA achievement levels are strongly linked to success in a tertiary setting. Likewise, secondary school achievement was the most important factor identified to predict tertiary academic performance (Engler, 2010). Students with low secondary achievement levels were less likely to pass the majority of their first year tertiary courses, while students with higher levels of academic achievement had far higher rates of successful course completion. At the higher levels of NCEA attainment, the probability of students passing the majority of their courses ranged from approximately 80% to nearly 100% (Engler, 2010).

Demographic Variables

The current study includes the same background variables as Study 1: sex, ethnicity, home language, socio-economic status, family structure and student level of employment. The final two variables are measured again in the current study, while the remaining variables apply values from Study 1 as they are assumed to be constant. Ethnicity and home language were not analysed further because of the small number of participants in some of the categories. The predictive value of each of these variables has been discussed, and will only be mentioned here with regard to their effect on tertiary achievement specifically.

Sex.

Recent New Zealand research has identified a higher female participation rate in tertiary education than for males (Ministry of Education, 2009d). This higher participation rate is more pronounced for Level 5 – 9 qualifications (Diploma

level to Masters level), and at degree level females are 20 percentage points more likely to participate in tertiary study than males (Ministry of Education, 2007a). Likewise, five-year completion rates show that females have higher rates of retention or successful completion than males for all tertiary qualification up to Honours level qualifications (Ministry of Education, 2007c). Females are 22 percentage points higher than males on qualification completion across all levels, and 26 percentage points higher on degree level courses (Ministry of Education, 2007a).

These differences in attainment are more disparate than secondary level findings, although the findings again do not consider the 'level' of the qualification. Similar to secondary studies which do not consider certificate endorsement, these tertiary studies do not consider grades. Given the significance of the number of credits attained, it is possible that female students complete tertiary qualifications, but do not do so with a greater level of academic merit than males. This is consistent with a study on 2004 school leavers, which found that females were not significantly more likely to pass all their first year tertiary courses than males (Scott, 2008). There may be no significant difference in GPA between males and females.

Socio-economic status.

There have been a variety of findings on the effect of socio-economic status in academic achievement, with some studies concluding that it is not significant (Scott, 2008), and others suggesting that it does affect achievement (Evans, 1999;

Leach & Zepke, 2005). Other studies have found that the decile of the school that a student last attended affects the choice to enter tertiary study (Choat, 1998; Maani, 2000), and that lower socio-economic students are underrepresented in tertiary institutions (R. James, 1999, 2001). One study found that students from decile 9 and 10 schools were five times more likely to enter tertiary education than those from decile 1 and 2 schools (Choat, 1998). This differential persists when intelligence and prior achievement are controlled for (Maani, 2000). Socio-economic status also appears to affect the type and level of tertiary study that students choose to enrol in, with one study finding that university enrolments increased and polytechnic enrolments fell as socio-economic status increased (Maani, 2000). However, another study did not find that socio-economic status significantly affected the decision to enter Bachelor's level study, although it did find significant effects at certificate and diploma level (Ussher, 2008).

There were 69 participants from low decile schools in Study 1 (approximately 10% of the sample), of which 28 (40.6%) attained a University Entrance qualification. It was impossible to predict how many of these students had enrolled to study at the University of Canterbury and, of those, how many would choose to participate in the current study. It seemed likely that the sample of low decile students would be too small to produce a significant effect.

Employment.

A New Zealand study found that students who were working whilst in secondary school (ages 13 – 16) and were in education at ages 18 and 21 were more likely to

be working than not working while at university (Maloney, 2004). This suggests that participants in the current study would be more likely to work if they reported having been in paid employment in Year 13.

Some studies have found that increasing levels of student employment have a negative effect on tertiary academic achievement (DeSimone, 2008; Vickers, Lamb, & Hinkley, 2003), with one of these studies specifically concerned with the achievement of first year tertiary students (McKenzie & Schweitzer, 2001). Haultain (2009) found that first year tertiary students had higher GPAs if they were not employed. Other studies have found that a moderate level of employment is not detrimental to achievement (Manthei & Gilmore, 2005). Given these finding and the significant relationship between employment and student achievement in Study 1, paid employment may be negatively related to student achievement in the current study.

Intelligence

Intelligence was the strongest predictor of achievement in the first study. Some previous studies have also found a correlation between intelligence and achievement in tertiary settings (Chamorro-Premuzic et al., 2009; Poropat, 2009), although others have not (Naderi et al., 2008). Ackerman (1994) proposed that the reason for this seemingly diminishing relationship between intelligence and achievement arises because intelligence is a measure of maximal rather than typical performance. Thus, intelligence tests measure what students are capable of doing intellectually, rather than what students *will do* intellectually (Furnham et

al., 2009). It has been suggested that other student-level characteristics are therefore more valuable than intelligence in predicting students' actions rather than potential (Chamorro-Premuzic & Furnham, 2005).

Likewise, at this higher level of study students have already been accepted into institutions on the basis of prior achievement which, in Study 1, was most strongly predicted by student intelligence. Given the relationship between intelligence and student achievement in Study 1, it was likely that there would be a restriction in range in the current sample. Because attainment rates were higher for more intelligent students, the participants in the current study were predicted to be higher in intelligence than students who participated in Study 1 but did not participate in this study. This restriction in range also made it likely that the findings of the current study would be consistent with findings in some previous studies, in which the predictive ability of intelligence has been less than that of other variables, such as attitudinal or personality variables (Furnham et al., 2009).

Personality

Each of the five personality variables measured in Study 1 was a significant predictor of one or more of the Year 13 secondary variables, with openness to experience the strongest predictor of the five factors. This was contrary to what was hypothesised, as three previous meta-analyses found little to no correlation between achievement and extraversion, agreeableness or neuroticism. Two of the three meta-analyses considered post-secondary achievement specifically (O'Connor & Paunonen, 2007; Trapmann, Hell, Hirn et al., 2007), and the third

meta-analysis separated achievement data into primary, secondary and tertiary levels (Poropat, 2009). Given that the current sample is drawn from a group of participants for whom personality was strongly related to achievement, and that literature suggests that personality is a stronger predictor of achievement in tertiary settings than in secondary (Furnham et al., 2009), it was predicted that each of the five personality variables would significantly correlate with student achievement. However, Study 1 found a positive relationship between neuroticism and achievement, which is inconsistent with most previous findings (Chamorro-Premuzic & Furnham, 2003; Sanchez-Marin, Rejano-Infante, & Rodriguez-Troyano, 2001). This positive relationship may continue in the current study due to participants in the current study being a subset of Study 1 participants.

The three meta-analyses examined found that the relationship between conscientiousness and achievement at tertiary level was the strongest of the five personality factors, and that openness to experience was also weakly positively correlated with tertiary achievement. In Study 1, openness to experience explained the most variance of the five personality traits on two of the three achievement variables, and had the strongest relationship with achievement in the structural equation model.

This is contrary to previous findings that conscientiousness is the strongest personality predictor of achievement, with one study finding that conscientiousness predicted university GPA better than secondary achievement (Noftle & Robins, 2007), and another study finding that conscientiousness

predicted university GPA better than intelligence (Poropat, 2009). This may be because of the relaxed requirements for attendance and submission of non-assessed work in a tertiary setting compared to a more proscriptive secondary setting.

As discussed in Study 2, personality measures tend to have high levels of test-retest reliability (Avshalom Caspi, Roberts, & Shiner, 2005; Viswesvaran & Ones, 2000). It was likely that there would be strong positive correlations between participant scores on the five personality variables in the first study and their scores in the current study. It is worth noting that the openness to experience scale being completed in the current study differs from the scale that participants completed in the first study. There is a huge amount of variance in the strength of the correlation between different personality scales (Viswesvaran & Ones, 2000), and thus it was possible that the correlation between openness to experience in Year 13 and first year tertiary would be decreased by the use of a different measure.

Attitudes and Beliefs

Of the four attitudes measured in the first study, regression analyses only identified having a positive view of school as a significant predictor of student achievement in Year 13. In addition to having a positive view of school, believing that education pays and having high levels of perceived parental involvement correlated positively with achievement when considered in isolation.

There are a number of studies measuring students' satisfaction with the tertiary course and institution they have chosen and relating this to achievement and retention variables (McKenzie & Schweitzer, 2001; Robbins et al., 2004). Likewise, many studies consider the effect of attitudes towards secondary school on the decision to enrol in tertiary education (Looker, 2001; Payne, 2003). One study found that there was little difference in tertiary satisfaction levels based on students' previous attitudes towards secondary school (Hillman, 2005), but did not consider this in relation to achievement.

There is a considerable cost to participating in tertiary education in terms of time, money and other missed opportunities. Thus, it is presumed that students who choose to participate in tertiary education must have some purpose for doing so. One study showed that students often chose to change course or leave tertiary education based on economic considerations (Hillman, 2005). These considerations were not financial concerns, but rather whether they judged the course or qualification as likely to lead to a good career in the future (Hillman, 2005; Taaffe & Cunningham, 2005). Likewise, having a strong career orientation is significantly related to tertiary retention (McKenzie & Schweitzer, 2001).

Perhaps the most surprising finding of Study 1 was that holding an entity theory of intelligence was only significantly correlated with one of the three achievement variables, despite a large body of previous literature finding a strong negative relationship between achievement and having an entity theory of intelligence (Dweck et al., 1995; Henderson & Dweck, 1990). One study considering the

effects of theory of intelligence on students in a tertiary setting found that students with an entity view of intelligence had lower self-esteem and were more likely to adopt a more helpless response pattern compared to their incrementally oriented peers (Robins & Pals, 2002).

Previous studies utilising the theory of intelligence scale have found high levels of test-retest reliability both in the short-term (Dweck et al., 1995), and over a long term, such as after one or two years ($r = .67$ and $.57$ respectively) (Robins & Pals, 2002). It was therefore predicted that students' theory of intelligence would remain stable compared with Study 1, and that the repeated measure of theory of intelligence in the current study would have a strong positive correlation with the previous measure.

Many studies have found that parental involvement or influence is a significant predictor of students' choice to enrol in tertiary education; see Leach & Zepke (2005) for a review. Some studies reported it as the strongest influence on student decision making regarding higher education (Cabrera & La Nasa, 2000; Payne, 2003), particularly for school leavers compared to mature students (Harker, Slade, & Harker, 2001).

Study Strategies

Findings of the influence of study strategies on student achievement have been previously discussed. While individual studies have varied in their findings, two cited meta-analyses linked each of the study strategies in the first study and the

current study with higher levels of student achievement (Lavery, 2008; Purdie & Hattie, 1999). Despite this, only self-regulation strategies significantly predicted student achievement in the regression analyses and structural equation models shown in the first study. Two studies applying structural equation modelling to the effect of study strategies in a tertiary setting found that self-regulation was a significant predictor of tertiary achievement (Blickle, 1996; McKenzie, Gow, & Schweitzer, 2004). One of these studies also related critical thinking strategies to tertiary achievement (Blickle, 1996). Based on previous findings, self-regulation may continue to be the only significant strategy to predict achievement in the current study.

Method

Participants

Participants were 62 University of Canterbury students who had previously participated in Study 1 in 2008, and are called ‘full participants’ throughout. The 2008 responses of all 178 Study 1 participants who attended the University of Canterbury in 2009 were also included in some analyses. These students are called ‘partial participants’ throughout. The remainder of the Study 1 sample are referred to as ‘non-enrolees’.

Four hundred and fifty-four students out of the 654 participants in Study 1 attained a University Entrance qualification in 2008. These eligible students were accessed in the University of Canterbury student database and 178 current student

email addresses were obtained. Students were then emailed and invited to participate in the study. The email doubled as an information sheet, and a copy is attached as Appendix J. The email explained that the online questionnaire would take approximately ten minutes to complete, and offered respondents the chance to win one of five prizes of \$50 cash. 74 students responded to the online questionnaire, which generated 62 useable responses because 7 responses did not provide consent for the researcher to access their Grade Point Average (GPA) and 5 responses could not be conclusively linked to results generated in 2009.

To ensure that the maximum number of students responded fully to the questionnaire, only the minimum number of scales necessary were included. It was anticipated that stating that the questionnaire would only take ten minutes to complete would encourage more students to participate in the study. Likewise, it was hoped that having a short questionnaire would minimise fatigue, and minimise the number of students who failed to complete it. Of the 74 respondents, 5 students did not complete the entire questionnaire (6.8%). These students were 5 of the 7 that did not provide consent to access GPA, as the consent questions were on the final page. It should be noted, however, that these responses do not represent 74 individual students, because some students submitted more than one partially completed questionnaire, or submitted a questionnaire with insufficient identifying information to locate university results.

Achievement Variables

The University of Canterbury registry released 2009 GPAs for each of the 62 full participants. Prior academic achievement was measured with NCEA results for Year 13 for each participating student. The same NCEA achievement variables were used as in Studies 1 and 2: the total number of Level 3 credits attained, the percentage of credits (attempted or achieved) at a Merit and Excellence level, and the endorsement level of their Level 3 qualification.

Instrument

Students completed a questionnaire similar to the one they completed as part of Study 1, although a number of scales from the original questionnaire were omitted. A copy is attached as Appendix K. Demographic questions appeared at the beginning of the questionnaire, followed by the personality scale, and then the study strategy scales. The demographic section had a multiple choice question and a free response question, the personality scale was answered on a seven-point Likert scale, and the remaining scales were answered on a five-point Likert scale. All participants completed the questionnaire in the same order.

Demographic information.

The demographic information collected was family structure and the hours the respondent spent in paid employment. Responses to the 2008 questionnaire were used for sex, ethnicity, occupation of principal household earner and home language, as they were assumed to remain constant.

Intelligence.

The previous scores obtained from Study 1 were used in the current study because intelligence scores are assumed to remain approximately constant. For example, test-retest reliability on subscales of the WAIS range from $r = .67 - .94$ (Wechsler, 1997).

Personality.

The personality scales used were the same as those in Study 2, and consisted of four three item measures of extraversion, conscientiousness, agreeableness and neuroticism and an eight item measure of openness to experience.

Attitudes and beliefs.

Responses from Study 1 were used for economic view of education, positive view of school and parental involvement. Previous studies have also found a significant relationship between view of intelligence and student achievement. Study 1 found significant negative correlations between achievement and having an entity view of intelligence for one of the three achievement variables, but having an entity theory of intelligence no longer significantly predicted student achievement when other variables were introduced. Thus it was decided to re-measure theory of intelligence to study whether the scale has high test-retest reliability with the current sample of students, as per previous studies, or whether this cohort differs from previous studies on both the measure's relationship to achievement and its test-retest reliability. The same three-item scale was used as in Studies 1 and 2.

Study strategies.

The four study strategy scales used were the scales identified by factor analysis in Study 1. The scales include items originally taken from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991), which was originally written for a tertiary setting. In Study 1, these items were amended to suit a secondary setting, such as by changing ‘lecture’ to ‘class’. In the current study, the items were changed to reflect a tertiary setting, such as ‘class’ to ‘lecture’ (as per the original scale), or ‘textbook readings’ and ‘class readings’ to ‘course readings’.

Procedure

Students were contacted by email and invited to complete the online questionnaire using the link provided. The email informed students of the content of the questionnaire and that they would be asked to give consent for the researcher to access their GPA for the year. The email included a response deadline of one month after the date of the email and one week before this deadline, participant responses were downloaded and students who had completed the questionnaire were excluded from the contact list. The remaining contact list was then sent an email reminder of the questionnaire, the deadline, and the opportunity to win a cash prize. Following the deadline, all respondents who had completed the entire questionnaire were assigned a randomised number. Participants were ordered in ascending order of these numbers, and the five top-ranked students were awarded the cash prizes.

Results

Each set of results is dealt with in its relevant section and a number of correlation matrices are reported between GPA and the results being presented in that section. For a correlation matrix of all variables, see Appendix L. While the use of a large number of t-tests has increased the risk of type one error, it is important to note that in the case of two of the significant groups of variables in Table 40 (achievement and intelligence), multiple dependent variables protect against the likelihood of this error. The possibility of other results being attributable to type one error is lessened due to the consistency of significant results with the findings in Study 1.

If results for the current sample are consistent with findings of Study 1 for Year 13 student achievement, this adds strength to findings in the current study. If results are not consistent, this either suggests that the current cohort is not representative of overall participants in the first study, or that smaller participant numbers have resulted in less statistical power, or that the characteristics of those who attain University Entrance qualifications lead to a restriction in range for some variables and thus lessen correlations between variables.

Comparison of Enrolees and Non-enrolees

The scores of all Study 1 participants who were enrolled at the University of Canterbury in 2009 were compared to the non-enrolees, as shown in Table 40. The two groups had significantly different results for the two socio-economic measures, with participants who enrolled at university attending higher decile

schools and having parents with higher status occupations. Full and partial participants also had significantly higher levels of intelligence and openness to experience than non-enrolees. These findings are consistent with those of Study 1, because each of the variables on which enrolees scored significantly higher in the current study were significant predictors of Year 13 attainment. Year 13 attainment is a determiner of students' eligibility to enrol at University, and thus it would be expected that the full and partial participant cohort would have had higher scores on those variables previously shown to relate to achievement.

Table 40

Comparison of Results for Full/Partial Participants and Non-enrolees

Variable	Full and Partial Participants			Non-enrolees			<i>t</i> value	<i>p</i>
	M	SD	<i>N</i>	M	SD	<i>N</i>		
Demographics								
Decile	7.30	1.58	178	6.72	2.13	476	-3.33	.01
Occupation	63.17	18.68	160	57.29	20.01	380	-3.18	.01
Employment	5.89	6.09	177	6.13	7.07	475	0.40	ns
Personality								
Extraversion	4.77	1.07	178	4.83	1.08	474	0.54	ns
Conscientiousness	5.13	1.04	178	5.06	0.99	474	-0.71	ns
Agreeableness	5.77	0.78	178	5.74	0.90	476	-0.44	ns
Neuroticism	3.11	1.02	178	3.09	1.03	474	-0.15	ns
Openness to Experience	5.40	0.81	178	5.23	0.90	474	-2.23	.03
Attitudes and Beliefs								
Entity theory of Intelligence	2.50	1.06	178	2.58	0.99	476	0.93	ns
Positive View of School	3.53	0.85	178	3.47	0.86	476	-0.87	ns
Value of Education	3.36	0.69	178	3.39	0.78	476	0.50	ns
Parental Involvement	3.47	0.84	178	3.45	0.81	476	-0.25	ns
Intelligence								
Verbal	4.94	1.53	178	4.45	1.82	476	-3.22	.01
Mathematical	4.49	2.00	178	3.76	2.01	476	-4.14	.01
Critical Reasoning	5.40	1.33	178	4.78	1.45	476	-4.98	.01
Total	14.84	3.96	178	12.99	4.29	476	-5.00	.01
Study Strategies								
Time Management	2.45	0.97	178	2.37	0.89	476	-0.93	ns
Critical Thinking	3.16	0.74	178	3.27	0.75	476	1.70	ns
Strategic Skills	3.31	0.80	178	3.40	0.79	476	1.25	ns
Self-regulation	2.90	0.82	178	2.93	0.72	476	0.39	ns
Achievement								
Credits	95.38	21.20	178	74.86	31.72	476	-7.99	.01
Merit and Excellence	37.71	23.57	178	22.69	23.49	476	-7.27	.01
Level 3 attainment	2.48	0.75	178	1.85	0.79	476	-9.20	.01

Full and partial participants also had significantly higher levels of attainment on the three Year 13 achievement variables. This is not surprising because it is difference in academic achievement that enables this subset of participants to attend university. Therefore, attending university is in itself a measure of academic achievement.

Full participants in the current study ($N = 62$) were also compared to partial participants and non-enrolees ($N = 592$). The findings were similar to the comparison of full and partial participants with non-enrolees, with full participants attaining significantly high scores on decile, occupation, intelligence and Year 13 attainment. Full participants in the current study did not have a significantly higher level of openness to experience than non-participants ($t(650) = -1.57, p = ns$). When full and partial participants were compared, the only significant difference was on Year 13 attainment. Full participants had higher levels of Year 13 achievement on two of the three variables: number of credits attained and Level 3 attainment, as shown in Table 41.

Table 41

Comparison of School Achievement for Full and Partial Participants

	Full Participants ($N = 62$)		Partial Participants ($N = 116$)		t value	p
	M	SD	M	SD		
Credits	101.82	22.36	91.93	19.80	-3.03	.00
Merit and Excellence	42.29	23.05	35.26	23.57	-1.90	ns
Level 3 attainment	2.66	0.75	2.39	0.74	-2.34	.00

Predictors of Tertiary Achievement

Participant completion rates were high, with all questions answered by a minimum of 61 of the 62 participants. There were only six missed responses in the data set, two of which were by the same participant on the critical thinking scale. Where this occurred, the participant's mean score on that scale was calculated based on the smaller number of responses.

Achievement Variables

The mean GPA of full participants was 5.56, and ranged from 0.33 to 9.00, with a standard deviation of 2.34. The mean number of credits attained by these participants was 101.82, and ranged from 49 to 145, compared with a mean of 78.20 for partial participants/non-enrolees. This included all credits at Achieved, Merit and Excellence levels. The percentage of credits that were attained at Merit and Excellence levels is a percentage of all credits attempted, and the total credits for calculating this percentage includes credits that were attempted but not attained. This ranged from 0% to 92.62%, with a mean of 42.29% for full participants (25.16% for partial participants/non-enrolees) and a standard deviation of 23.05%. The third achievement variable analysed in Year 13 was whether participants attained a Level 3 (or above) qualification, and what the endorsement level of this qualification was. Only 1 full participant (1.61%) did not attain a Level 3 (or above) qualification in Year 13, compared with 29.39% of partial participants/non-enrolees. 45.16% attained a Level 3 qualification with no endorsement (50.84% for partial participants/non-enrolees). 38.71% attained a Level 3 certificate with Merit (14.36% for partial participants/non-enrolees) and 14.52% attained a Level 3 certificate with Excellence (5.41% for partial

participants/non-enrolees). As shown in Table 42, the correlations between each of the 2008 achievement variables are positive and large and each of the three achievement variables had a strong positive correlation with university GPA.

Table 42

Correlations between Achievement Variables (N = 62)

	Credits	Merit and Excellence	Level 3 attainment	GPA
Credits	1.00	.60**	.69**	.61**
Merit and Excellence		1.00	.82**	.72**
Level 3 attainment			1.00	.64**
GPA				1.00

* $p < .05$, ** $p < .01$

Demographic Information

Table 43 shows the demographic breakdown of full participants. It should be noted that not all participants responded to all of the demographic questions. Responses to the family structure question and hours of employment question were compiled from 2009 responses, and the remaining questions used 2008 data. Overall, a lower percentage of males participated in the study than participated in the original study (47.71% in Study 1 compared with 35.48% in the current study). The most pronounced difference between the 2008 sample and the 2009 sample was the proportion of students who had attended schools of different decile ratings. The percentage of students who had attended low decile schools and then participated in the current study was less than half the proportion of those attending low decile schools in 2008 (4.84% in the current study compared with 10.55%). The percentage of students who had attended a medium decile

school was also lower than the overall 2008 sample (12.90% in the current study compared with 17.89%). These differences were statistically significant ($\chi^2 = 7.87$, $df = 2$, $p < .05$). This is consistent with the finding that participants (full and partial) had significantly higher decile means than non-enrolees.

Table 43

Demographic Characteristics of Participants

Variable	<i>N</i>	Percentage	
Participant level (<i>N</i> = 62)			
Sex			
Male	22	35.48%	
Female	40	64.52%	
Ethnicity			
NZ European	40	64.52%	
Māori	4	6.45%	
Pasifika	2	3.23%	
Asian	11	17.74%	
Other	5	8.06%	
Home Language			
English	56	90.32%	
Other	6	9.68%	
Family Structure			
Nuclear	41	66.13%	
Solo parent	14	22.58%	
Other	7	11.29%	
School Decile			
Low	3	4.84%	[10.55%]
Medium	8	12.90%	[17.89%]
High	51	82.26%	[71.56%]
Employment			
None	18	29.03%	
Low (<10 hrs/wk)	35	56.45%	
High (>10 hrs/wk)	9	14.52%	
Socio-economic status			
Beneficiary	1	1.61%	
Low	10	16.13%	
Medium	13	20.97%	
High	34	54.84%	

Full participants worked an average of 6.25 hours per week. This ranged from 0 hours per week to 40 hours per week, with a standard deviation of 6.81. This mean level of employment was similar to Study 1, although a greater proportion of full participants worked either a moderate amount or not at all (85.48%) compared with the 2008 sample (76.68%). The mean occupation score was 64.52, and ranged from 0 (beneficiaries, not classified under the Occupation index) to 90, with a standard deviation of 17.23. Occupations were further categorised into low, medium and high socio-economic occupations. There was no significant difference between males and females, as shown in Table 44.

Table 44

Comparison of Achievement for Male and Female Participants

	Male (<i>N</i> = 22)		Female (<i>N</i> = 40)		<i>t</i> value	<i>p</i>
	M	SD	M	SD		
GPA	5.12	2.60	5.80	2.17	1.11	ns

Analysis of variance did not find a significant difference in attainment for the different decile levels. However, when decile was divided into two categories (Low/Medium and High), analysis showed significantly higher attainment for full participants who had attended high decile schools (see Table 45).

Table 45

Comparison of Achievement for Different Decile Groups

	Low/Medium (<i>N</i> = 11)		High (<i>N</i> = 51)		<i>t</i> value	<i>p</i>
	M	SD	M	SD		
GPA	4.17	3.37	5.86	1.97	2.24	.03

Correlation showed that was no significant difference in achievement based on participant hours of employment for either 2008 responses or 2009 responses. This is not consistent with findings from Study 1, which found that participants who worked up to ten hours per week had the highest levels of attainment. Likewise, there were no significant differences in achievement between participants with differing levels of socio-economic status, which is contrary to Study 1 findings. Table 46 shows that decile is significantly related to student achievement, with students who attended higher decile schools attaining higher GPAs.

Table 46

Correlations between Demographic and Achievement Variables (N = 57)

	School decile	Occupation	Employment	GPA
School decile	1.00	.05	.04	.28*
Occupation		1.00	-.17	.09
Employment			1.00	.11
GPA				1.00

* $p < .05$, ** $p < .01$

Intelligence

Table 47 shows the relationship between the intelligence and achievement for participants in the current study. Total intelligence was calculated in 2008, and was out of a total of 21 possible points (7 questions on each of the three subscales). The three intelligence subscales were strongly positively correlated with one another, and were very strongly correlated with total intelligence as the

total intelligence scale is made up of the sum of the three subscales. Total intelligence was significantly correlated with GPA and, as predicted, the correlation was smaller than the correlations between intelligence and each of the achievement variables in Study 1.

Table 47

Correlations between Intelligence and Achievement Variables (N = 62)

	1	2	3	4	5
Verbal (1)	1.00	.38**	.44**	.73**	.21
Mathematical (2)		1.00	.47**	.86**	.25
Critical Reasoning (3)			1.00	.76**	.19
Total Intelligence (4)				1.00	.28*
GPA (5)					1.00

* $p < .05$, ** $p < .01$

Personality

Internal reliability was computed for each scale. The Cronbach's alpha coefficient for each scale was .67 for extraversion ($M = 4.54$, $SD = 0.91$), .72 for conscientiousness ($M = 5.15$, $SD = 0.95$), .72 for agreeableness ($M = 5.79$, $SD = 0.80$), .53 for neuroticism ($M = 3.26$, $SD = 1.03$) and .76 for openness to experience ($M = 5.72$, $SD = 0.67$). These are good internal reliability levels for conscientiousness, agreeableness and openness to experience, and adequate levels of reliability for the remaining two scales.

Table 48 shows the relationship between responses to the personality scales in 2008 and 2009. Levels of conscientiousness, agreeableness and neuroticism had

not changed significantly. Participant extraversion was significantly lower in 2009 than in 2008 and openness to experience was significantly higher. None of the personality variables were significantly correlated with GPA.

Table 48

Comparison of Personality Measures 2008 - 2009

	2008 Measures (N = 62)		2009 Measures (N = 62)		<i>t</i> value	<i>p</i>	<i>r</i> with GPA
	M	SD	M	SD			
Extraversion	4.74	0.97	4.54	0.90	-2.12	.04	-.06
Conscientiousness	5.23	1.02	5.15	0.94	-0.89	ns	.21
Agreeableness	5.81	0.74	5.78	0.80	-0.26	ns	.18
Neuroticism	3.23	1.06	3.26	1.02	0.25	ns	.12
Openness to Experience	5.45	0.86	5.72	0.66	2.76	.01	.18

p* < .05, *p* < .01

Study Strategies

Internal reliability was computed for each of the scales. The Cronbach's alpha coefficient for each scale was .85 for the time management scale (M = 2.35, SD = 0.86), .74 for the critical thinking scale (M = 2.82, SD = 0.91), .81 for the strategic skills scale (M = 3.33, SD = 0.66) and .81 for the self-regulation scale (M = 3.46, SD = 0.72). These are high levels of reliability.

Table 49 shows the relationship between responses to the study strategies scales in 2008 and 2009. The use of time management, critical thinking and strategic skills at first year tertiary was similar to the level of usage in Year 13. However, the use

of self-regulation skills was significantly lower. None of the study strategies were significantly correlated with GPA.

Table 49

Comparison of Study Strategies 2008 - 2009

	2008 Measures (<i>N</i> = 62)		2009 Measures (<i>N</i> = 62)		<i>t</i> value	<i>p</i>	<i>r</i> with GPA
	M	SD	M	SD			
Time Management	2.56	1.03	2.35	0.79	1.54	ns	.08
Critical Thinking	3.48	0.80	3.31	0.66	0.55	ns	.00
Strategic Skills	3.35	0.70	3.46	0.71	-0.36	ns	-.04
Self-regulation	3.66	0.74	2.67	0.66	-2.07	.04	.14

p* < .05, *p* < .01

Discussion

The following discussion considers the predictors of tertiary achievement first, and then compares these to the findings of Study 1. Before considering the findings of each study in more detail, it is important to recall the differences between the participant sample in Study 1 and the full participant sample in the current study. There are three essential differences, each of which constitutes a limitation or consideration of the current study. Firstly, the sample size in the current study is approximately 10% of the participants in Study 1, which makes the results more prone to bias, and less reliable than the findings of Study 1.

The second limitation is the restriction in range on some of the measures in the study. As previously discussed, participants in the current study needed to have gained a University Entrance qualification, meaning that they differed from the Year 13 cohort, only 69.4% of whom went on to gain an entrance qualification. The results of Study 1 showed a strong relationship between some variables and student achievement. Higher levels of student achievement make it more likely that a student will enrol in tertiary study. Thus, the current sample of students was likely to be restricted in range on some measures, leading to lower correlations between variables and student achievement (Ramist, 1984).

The final limitation is the extent to which the current sample self-selected. Only 33% of those contacted chose full participation in the study and it is possible that the remaining students who chose not to participate differed in some meaningful way from those who did. Because of the availability of previous data on those participants, it was possible to ascertain that the two groups (full and partial participants) differed significantly on level of Year 13 achievement. Given the strong relationship between Year 13 achievement and tertiary achievement, it is possible that this led to further restriction in range in the current sample beyond even that generated by the restriction of including only those participants who met tertiary entrance criteria.

The sample size of 62 full participants constitutes 9.5% of the original participant sample. A recent study which tracked 1,232 Year 13 students to their first year of tertiary study resulted in a final sample of 102 tertiary students, or 8.3% (Haultain,

2009). Thus, while such a small sample is less than ideal, it appears commensurate with the findings of other similar studies.

Predictors of Tertiary Achievement

Secondary achievement variables had the strongest positive correlations with tertiary GPA of the variables considered, which is consistent with previous findings about the value of secondary achievement as a predictor of tertiary achievement (Engler, 2010; Hattie, 2009; Ussher, 2008). The subscales of intelligence were not significant predictors, but total intelligence was significant. School decile (low/medium compared to high) was also a significant predictor of GPA.

Comparison with Secondary Achievement Predictors

Sex was a significant predictor of student achievement in the first study, but did not significantly predict GPA in the current study. Positive view of school and the subscales of intelligence were also not significant predictors in the current study but were significant predictors of secondary achievement in Study 1. Overall intelligence was a significant predictor in the current study, which suggests that there is still a relationship between intelligence and achievement at a tertiary level. School decile predicted tertiary achievement in the current study, in addition to predicting Year 13 achievement in Study 1.

Each of the Big Five personality variables predicted achievement in Study 1, but none were significantly correlated in the current study. Openness to experience

was the strongest personality predictor of achievement in the first study, and yet the strongest correlation in the current study is with conscientiousness.

The relationship between employment and achievement was significant for Study 1, but was not significant in the current study. It is possible that this is due to restriction in range, as the maximum number of hours worked in the current study was 22 compared with 48 in the first study.

Cohort Differences

Both full and partial participants differed significantly from non-enrolees on a number of variables. Both full and partial participants in the current study had significantly higher levels of secondary achievement than non-enrolees. This is consistent with previous findings that final year secondary achievement is a strong predictor of the decision to enrol in tertiary study (Engler, 2010; Scott, 2008). Indeed, depending on the level of achievement, it may act as an actual barrier to enrolment. Thus, some participants in Study 1 were not eligible to enrol at the University of Canterbury because they had no entrance qualification.

The only significant difference between enrolees who participated in the current study and enrolees who did not was that participants had significantly higher achievement levels on two of the three secondary achievement variables than non-participants. At the time students were invited to take part in the study they would have already received their results from the first semester and based on the strong link between prior achievement and current achievement levels, it is likely that

students with a lower level of secondary achievement would have also had a lower level of tertiary achievement. The invitation to participate stated that participants would be asked to give permission for the researcher to access their 2009 GPA so it is possible that potential participants were discouraged from becoming full participants because they felt uncomfortable or embarrassed about their results.

If this suggestion is accurate, it indicates that there may have been a further restriction in range on some variables than already anticipated given the characteristics of those who achieve University Entrance. Specifically, the current participants may have had less variation in GPA than a wider group of university-enrolled participants would have had. If this research were to be repeated, there are several possibilities for attracting a wider pool of participants. Firstly, if the decision not to take part was prompted by a reticence to reveal low achievement, conducting the study earlier in the year may lessen this effect. If the study were conducted when participants had not received much feedback on their achievement levels, they might not be concerned about disclosing their GPA. The downside of this is that the current study also considered which study strategies students used at secondary school compared with in their first year of tertiary study. If the study was conducted early in the year, students may not have had time to adapt their use of study strategies to suit the new academic setting. Other variations could have been to offer a certain rather than an uncertain incentive, or to offer a non-financial incentive.

Participants in the current study (full and partial) had significantly higher intelligence levels than non-enrolees. This is consistent with the findings of Study 1, which found that intelligence (and its subscales) was a significant predictor of student achievement levels. Another difference between participants and non-enrolees was in socio-economic status. Both full and partial participants had significantly higher levels of parent/caregiver socio-economic status than non-enrolees. This is consistent with studies which found that socio-economic status affects the decision to enter tertiary study (Choat, 1998; R. James, 2001; Maani, 2000). Likewise, the link between socio-economic status and secondary achievement in the first study suggests that many lower socio-economic participants would not have had sufficient levels of achievement to be eligible to enter university. However, these studies and many other studies considering the effect of socio-economic status on tertiary achievement use aggregate measures of achievement such as decile of prior school or population indices. While decile was a significant predictor of secondary level achievement in Study 1, there was not a significant difference between full or partial participants or between participants and non-enrolees. This is interesting as it indicates that socio-economic status is related to both secondary achievement and the subsequent decision (or eligibility) to enrol in tertiary education, but that the two are linked to different measures of socio-economic status.

Study 1 found a strong link between socio-economic status as measured by parent/caregiver occupation and the decile of the school the student attended. While decile is indicative of school-level status, occupation is an individual-level

measure of the likely financial means of the family. A number of previous studies have found concern about the financial costs of tertiary education to be a far stronger deterrent for participants from low socio-economic backgrounds than those from higher socio-economic backgrounds (see Connor & Dewson, 2001, for a review). In New Zealand, Studylink provides a weekly Student Allowance payment to students whose parent incomes allow them to qualify. The 2010 income thresholds for eligibility are \$78,413 for students living in the family home and \$85,017 for students living away from the family home (Studylink, 2010). A repayable weekly living costs payment can be claimed by full-time students who do not qualify for the allowance.

While a detailed discussion of attitudes to debt and the financial costs of tertiary study are beyond the scope of this study, it is worth considering why socio-economic status continues to be a predictor of enrolment at university in the current study despite these government initiatives to enable lower socio-economic students to access tertiary study. Some studies suggest other explanations for the effect of socio-economic status, such as that lower socio-economic status students perceive the actual financial cost of tertiary study as being higher than higher socio-economic status students (Looker & Lowe, 2001) or that lower parental education levels lead to students not perceiving tertiary education as a viable or attractive option (Connor & Dewson, 2001; R. James, 1999).

The final disparity between the two groups was the significant difference between university participants and non-enrolees on openness to experience. This is

consistent with the findings of the first study, in which openness to experience was a strong predictor of two of the three secondary achievement variables. Given the link between secondary achievement and choosing (or being eligible) to enter tertiary study, it is unsurprising that participants have a higher mean level of openness to experience.

Full participants were hypothesised to score more highly on positive view of school, believing that education pays and parental involvement than non-enrolees. Perceiving that education pays and parental involvement were not significant predictors of achievement at a secondary level, but previous studies had linked them to tertiary entry decisions. The current study is not consistent with these findings, and it suggests that these variables did not influence the decision to enrol at the university. Likewise, while having a positive view of school was a significant predictor of student achievement in the first study, it did not appear to influence participant enrolment decisions in the current study.

Other Findings

A number of the original variables from Study 1 were measured again in the current study, and the findings correlated with the measure from Study 1. As expected, employment during a student's Year 13 year correlated positively with their level of employment during their first year of tertiary study. Likewise, view of intelligence and each of the personality variables had strong positive correlations between the 2008 and 2009 measures. The only two variables measured a second time that differed significantly from the first measure were

extraversion and openness to experience. The change in openness to experience is most likely due to a different measure being used in the current study (Viswesvaran & Ones, 2000). One longitudinal study which considered extraversion when participants were 16 and 18 years old found no significant change from Time 1 to Time 2 (Pullmann et al., 2006). Another study conducted with first and third year university students found a small mean increase in extraversion ($d = 0.33$) (Vaidya et al., 2002). The current study assessed participants at an interval of approximately 15 months, and found a significant decrease in extraversion. This is counter to the studies previously cited, which found little change or an increase. Perhaps the cohort of enrollees who enrolled to participate in this study differ from a more general sample of students of a similar age, or perhaps the result is a feature of the unreliability of a small sample.

Each of the 2008 study strategies had strong positive correlations with their 2009 counterpart, indicating that students tend to apply similar levels of most study strategies across the two different academic settings. However, the usage of self-regulation skills was significantly lower in the current study than in Study 1. There is emphasis placed on the value of study strategies such as critical thinking in the New Zealand curriculum so it would be useful to repeat these measures over a longer time period to ascertain which skills remain constant, and which tend to vary in response to the academic setting. Given the size of the cohort and the insignificant relationship between the use of study strategies thinking and student achievement, it is important to validate the findings of this study with a larger sample.

Future Research

The current study focussed only on student GPA as a measure of achievement, but other studies also include qualification completion rates or yearly retention rates. If a similar study were going to be conducted, it would be worthwhile including these as achievement measures, which could then extend the length of the study. This would then allow multiple collection points for GPA, which would provide further analysis into the influence of predictor variables at various levels of tertiary study. However, if the study were conducted earlier in the academic year, a retention measure could be introduced while still keeping the term of the research at a single year.

As in Study 1, learning area was not considered in the current study. This neglects the differing pass and achievement rates for different tertiary fields of study. For example, students in physical sciences and information technology have the lowest pass rates (Scott & Smart, 2005), which suggests that, as with secondary learning areas, tertiary fields of study are not created equal. Depending on the focus of the researcher, future research could consider the effectiveness of the current model on the different fields of study.

Conclusion

The current study identifies a number of variables that significantly predict student achievement at a first year tertiary level. Tertiary achievement in the current study was predicted by a smaller range of variables than those that predicted secondary school achievement in Study 1. Similar to Study 1, the

emphasis was on variables that were determined by genetics or circumstance rather than being within the immediate control of the student. The small sample size in the current study and the likely effect of restriction in range on some of the variables measured means that future research with larger participant groups should replicate these findings before they are generalised further.

Chapter 7: General Discussion

The following discussion pulls together the separate threads of the results previously discussed to gain a look at the complete tapestry of the findings of the three studies undertaken. The individual studies have been discussed in the relevant chapters and the findings of each study have been compared to previous results, both from studies by other researchers, and in terms of integrating each of the three studies with its predecessor(s).

The first study proposed an integrated model of student achievement which included a number of variables previously shown to relate to student achievement (as shown in Figure 1). This model provides a useful framework to consider the relative influence of these variables, many of which do not directly relate to student achievement. The study extends our understanding of student achievement by firstly identifying a number of influential variables, analysing their relative influence, and finally by graphically depicting the interrelationships between variables. The structural equation model not only shows the relationships, but also illustrates the complexity of predicting student achievement. Many of the relationships suggest that prior conclusions about the value of variables as predictors may have been based on the influence of other, unmeasured variables to which the significant variable directly relates. For example, the effect of ethnicity was entirely mediated by decile and view of school. A study measuring only ethnicity could have concluded that ethnicity is directly related to student achievement, rather than indirectly related due to its link to two proximal variables.

That the same possibility exists in the current work should not be overlooked. The questionnaire included several student-level variables, but time constraints meant that many other potential variables also shown to relate to student achievement had to be excluded. Thus, while the structural equation model in the current work extends our understanding of the multiple influences on student achievement, it cannot claim to be exhaustive. Likewise, the studies undertaken only considered student-level variables. Hattie's (2009) synthesis of meta-analyses ranked each of the 138 variables considered in order of effect size. Of the top twenty ranked variables, only three were student-level variables. This complexity is further extended by the significant interactions.

While some of the predictors of student achievement varied from study to study, there was a large degree of consistency for others. Prior achievement was the strongest predictor for both studies in which it was measured (Studies 2 and 3), which is consistent with previous findings (Hattie, 2009; Trapmann, Hell, Weigand et al., 2007). Decile was a strong predictor for both studies in which it was measured (Studies 1 and 3), which is also consistent with previous findings on the predictive value of measures of socio-economic status (Caygill et al., 2008a; Hattie, 2009), and on the greater predictive value of a school level measure over an individual measure (White, 1982).

Intelligence was a significant predictor of achievement in all three studies, which is also consistent with previous findings (Deary et al., 2007; Poropat, 2009; Strenze, 2007). It should be noted that when the regression analysis was

conducted in the second study with prior achievement included, intelligence was not a significant predictor. This suggests that while intelligence is an important predictor, it is less valuable as a predictor than prior achievement, and appears to act as a proxy when prior achievement is not included as a measure.

The structural equation model found a strong direct relationship between openness to experience and student achievement. This was supported by the results of the regression analysis, in which it was among the strongest predictors of the proportion of NCEA Merit and Excellence credits received and NCEA Level 3 attainment. This strong relationship led to its inclusion in the intervention that formed Study 2. The regression analysis conducted with participants in Study 2 found that openness to experience was also a significant predictor of achievement with that sample, and was the strongest predictor of the proportion of Merit and Excellence credits attained. However, conscientiousness had a far stronger relationship with the other two achievement variables. This is consistent with previous findings on the relationship between conscientiousness and student achievement (O'Connor & Paunonen, 2007; Poropat, 2009), but differed from Study 1 findings. None of the personality predictors were significant predictors of tertiary level achievement.

There were some variables that consistently predicted achievement; there were also variables that consistently failed to predict achievement. Nearly every variable in the first study was significantly related to student achievement, either in isolation, as part of the regression analyses, or as part of the structural equation

model. The sole exception to this was home language, which did not have an effect on achievement, possibly because of restriction in range in participants. Students need a high level of English proficiency to successfully complete study at Year 13 level, and thus it is likely that this restricted sample underestimated the effect of home language at different stages of study. Home language was also not significant in the remaining two studies. Students who are non-native English speakers had to successfully attain a University Entrance qualification to be approached as potential participants in Study 3. It is possible that Study 3 represented an even more restricted sample of non-native English speaking students than the other two studies.

A small number of variables correlated with student achievement, but were not significant when other variables were included. These included having an entity theory of intelligence, parental involvement, and the use of study strategies. The non-effect of parental involvement is less surprising than for the remaining variables, given the age group of the participants in each of the studies. It is possible that parental involvement would be significant with a younger age group. The lack of predictive value of the use of study strategies and having an entity theory of intelligence is not consistent with previous findings (Dweck et al., 1995; Purdie & Hattie, 1999). Self-regulation was a significant predictor in the first study, but time management, critical thinking, and strategic skills were not significant predictors in either the regression analyses or the structural equation model. None of the four study strategies were significant predictors in the two subsequent studies.

Many of the variables that were not good predictors of student achievement were those considered to be controlled by the student, rather than controlled by their genetics or family background. This finding suggests that, without an underlying set of characteristics closely linked to student achievement (intelligence, socio-economic status), a student will gain little benefit from applying higher levels of these study strategies or from having an incremental view of intelligence. This is consistent with Hill's (1990) examination of Lerner's (1971) 'just world' hypothesis. The study compared effort (time spent studying) with measures of academic achievement, in order to determine whether learners 'get what they deserve', and found little relationship between effort and academic achievement.

Purdie and Hattie (1999) state that the just world hypothesis is still applied to the use of study strategies, and that evidence showing that higher usage of study strategies does not lead to higher levels of achievement has been overlooked. The current results show that higher usage of study strategies is not strongly related to higher levels of achievement, and that any benefits gained from the use of study strategies are not consistently gained by all learners. The significant interactions found in Study 1 showed that more intelligent, wealthier and non-Māori participants benefited from greater use of study strategies. Again, in Study 2, high intelligence participants who increased their use of critical thinking skills experienced a significantly larger gain in achievement from their previous year's academic results than their lower intelligence peers. These interactions accentuate the complex nature of student achievement, as they demonstrate that influences on student achievement are not consistent for all learners.

Study 2 showed that study strategies appear less malleable than previous findings would indicate (Hattie et al., 1996). No significant overall increases were found for either the peer learning or critical thinking groups. The openness to experience group also did not increase in either openness to experience or achievement. However, this result may have been anticipated from previous findings about the inflexibility of personality characteristics (Roberts, 1997; Srivastava et al., 2003). When the complexity of student achievement is considered, perhaps it is not surprising that the intervention was unsuccessful. The multiple influences on achievement indicate that variables may not work in isolation in either predicting or influencing achievement.

When the lack of success in influencing student achievement is considered alongside the interactions, the implications of this lack of success become more critical. As previously discussed, low levels of student achievement have far reaching consequences for both individuals and society. Because of this, significant educational expenditure is targeted at programmes and initiatives which aim to raise student achievement. The education sector recognises a ‘tail of underachievement’, in which Māori, Pasifika and students from lower socio-economic backgrounds are disproportionately represented (Ministry of Education, 2009c). The intervention showed that participants attained no discernible benefit in either increased use of the target skills or in increased achievement. While this did not benefit those students overrepresented in the tail, it also did not disadvantage them compared to their peers. However, the interactions did not identify any starting points for addressing underachievement. There were no

interactions that suggested academic benefits for students from a lower socio-economic background or for Māori students. Instead, interactions showed that higher usage of critical thinking skills was not effective in raising student achievement for these disadvantaged subgroups. Furthermore, the use of critical thinking skills appeared to actually disadvantage Māori students. The first implication of this is that it would appear that it is more difficult to lift achievement than initially expected. The second important implication is that in an education system that is trying simultaneously to lift Māori achievement (Ministry of Education, 2008a) and increase usage of critical thinking skills (Ministry of Education, 2007b), the negative relationship between Māori achievement and their effective use of critical thinking skills should be urgently investigated.

Limitations

It is worth reiterating the limitations of a single, self-report questionnaire. The current study had limited access to participants, and so a self-report questionnaire was the only practical way of measuring the majority of the variables included. However, the social desirability element of some of these measures cannot be overlooked. Ideally, a study would verify these findings by triangulating with other methods of data collection such as classroom observations or school reports.

Another potential limitation is the social desirability of the five personality measures, with each of the five factors strongly correlated with one another. This is consistent with previous findings, although later research has suggested an

ipsative measure of the Big Five to overcome the social desirability ‘hurdle’ (Hirsh & Peterson, 2008). While this was beyond the time constraints of the current study, it is worth consideration in future studies.

Further research

The first study, though it had a relatively large number of participants and was therefore fairly robust, produced some findings contrary to previous findings, such as the positive relationship between neuroticism and some achievement variables, and between neuroticism and the perception that education pays. This, coupled with the new structural equation model showing an integrated model of predictors of student achievement, suggests a number of new research directions, both to verify and strengthen the current findings, and to extend them to different age groups and educational settings.

The third study attempted to ascertain the relative influence of predictor variables in a tertiary setting, but the small sample size resulted in many small groups which could not be reliably analysed. Replicating this study with a larger sample of tertiary students could add strength to the findings of Study 3, and might yield additional predictors of achievement. It would also allow further conclusions to be drawn about the value of predictor variables in different academic settings.

Likewise, it is worth repeating this research in a different geographic part of New Zealand. Christchurch, and the South Island more generally, has a relatively small number of Māori students compared to many areas of the North Island.

Christchurch also has relatively fewer low decile schools than areas of the North Island. Indeed, the current study did not include any secondary schools that were decile 1 because Canterbury does not have any decile 1 secondary schools. Readers should therefore exercise caution in generalising these findings to a wider New Zealand setting without further research that encompasses a greater number of Māori participants and across a wider range of school deciles.

Another possibility beyond the scope of this work is to further break down the achievement variables to consider the predictive ability of this model to the learning areas. The New Zealand Curriculum divides subjects into eight different learning areas. Students in Year 13 generally have a large degree of freedom about which subjects they choose to take, dependent on past results. Pass rates and the percentage of students attaining different grade levels are not consistent for each subject, meaning that NCEA subjects are not ‘created equal’. Thus, future research could consider the impact of these variables on grades in individual learning areas, or even in individual Achievement Standards. This would give a more consistent measure of achievement than the more general variables used in the current study, and would allow researchers to more specifically target their own areas of interest.

Many New Zealand schools have geographic enrolment zones, which are designed to prevent overcrowding and to best manage capacity within the network of state schools. Students living within the geographic enrolment zone are entitled to enrol in the school, while students living out of zone can apply to enrol. If the

school has excess space for the following academic year, a ballot is held to randomly select 'out of zone' students for the available places. Future research could distinguish whether students live inside or outside the geographic enrolment zones of each school. Schools situated within high socio-economic areas draw the majority of their students from those neighbourhoods, and will thus have higher decile ratings.

If achievement were analysed dependent on whether students lived within the school zone or in a lower socio-economic area, inferences could be drawn about whether the influence on achievement is due to the school attended, or the community in which the school is situated. It may be, for example, that students living in a higher socio-economic area have more convenient access to educational resources such as libraries, exhibitions or lectures than students living in a lower socio-economic area. In contrast, it may simply be the presence of a concentration of people with higher incomes and higher educational qualifications. Crane's (1991) research on 'neighbourhood effects', particularly the effects of neighbourhood on educational outcomes, may usefully inform such an intervention.

Conclusion

A number of variables showed themselves in this thesis to be consistent predictors of student achievement in both a secondary and tertiary setting. The structural equation model from the first study integrates the different predictor variables, and provides an understanding of the structure of the relationships between the

predictor variables themselves. Despite the small sample size, the final study still found a small number of significant relationships between predictor variables and student achievement. This adds strength to the value of decile, prior achievement and intelligence as predictors of achievement.

The lack of predictive value from the study strategies variables and having an entity theory of intelligence implies that attempting to influence student achievement through study and learning strategy interventions may not be effective in raising student achievement. This was supported by the findings of Study 2, in which the intervention neither increased achievement, nor increased the usage of target skills. However, the level of difference in achievement for the significant interactions highlights the importance of continuing to research the effect of study strategies on student achievement, particularly as they do not appear equal in their effect on achievement for all learners.

References

- Abrami, P. C., Bernard, R. M., Borokhovski, E., Wade, A., Surkes, M. A., Tamim, R., et al. (2008). Instructional interventions affecting critical thinking skills and dispositions: A stage 1 meta-analysis. *Review of Educational Research*, 78, 1102 - 1134.
- Ackerman, P. L. (Ed.). (1994). *Intelligence, Attention, and Learning: Maximal and Typical Performance*. Norwood, NJ: Ablex.
- Ackerman, P. L., & Heggstad, E. D. (1997). Intelligence, personality, and interests: Evidence for overlapping traits. *Psychological Bulletin*, 121, 219 - 245.
- Agronick, G. S., & Duncan, L. E. (1998). Personality and social change: Individual differences, life path, and importance attributed to the women's movement. *Journal of Personality and Social Psychology*, 74, 1545 - 1555.
- Ainley, J., Foreman, J., & Sheret, M. (1992). High school factors that influence students to remain in school. *The Journal of Educational Research*, 85, 69 - 80.
- Allik, J., & Realo, A. (1997). Intelligence, academic abilities and personality. *Personality and Individual Differences*, 23, 809 - 814.
- Amato, P. R., & Keith, B. (1993). Parental divorce and the well-being of children: A meta-analysis. *Psychological Bulletin*, 110, 26 - 46.
- Atashrouz, B., Pakdaman, S., & Asgari, A. (2008). The relationship between the Big Five personality traits and academic achievement. *Journal of Iranian Psychologists*, 4, 367 - 376.

- Atkinson, J., & Bastiampillai, N. (2006). New Zealand Census-Mortality Study WebTable. Retrieved June 5, 2010, from <http://www.otago.ac.nz/NZCMSWebTable>
- Austin, E. J., Hofer, S. M., Deary, I. J., & Eber, H. W. (2000). Interactions between intelligence and personality: results from two large samples. *Personality and Individual Differences*, 29, 405 - 427.
- Betts, J. R., & Morell, D. (1999). The determinants of undergraduate Grade Point Average: The relative importance of family background, high school resources, and peer group effects. *The Journal of Human Resources*, 34, 268 - 293.
- Biddulph, F., Biddulph, J., & Biddulph, C. (2003). *The Complexity of Community and Family Influences on Children's Achievement in New Zealand: Best Evidence Synthesis*. Wellington: Ministry of Education.
- Biggs, J. B. (1987). *Study Process Questionnaire Manual*. Australia: The Australian Council for Educational Research Ltd.
- Biggs, J. B., & Collis, K. F. (1982). *Evaluating the Quality of Learning: The SOLO Taxonomy*. New York: Academic Press.
- Bishop, R., Berryman, M., Tiakiwai, S., & Richardson, C. (2003). *Te Kōtahitanga: The Experiences of Year 9 and 10 Māori Students in Mainstream Classrooms*. Wellington: Ministry of Education.
- Blackwell, L. S. (2002). *Psychological Mediators of Student Achievement During the Transition to Junior High School: The Role of Implicit Theories*. Unpublished doctoral dissertation, Columbia University, United States.

- Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study. *Child Development*, 78, 246 - 263.
- Blickle, G. (1996). Personality traits, learning strategies, and performance. *European Journal of Personality*, 10, 337 - 352.
- Boyd, R. L. (2007). *A Meta-Analysis of the Relationship between Extraversion and Academic Achievement*. Unpublished doctoral dissertation, Hofstra University, New York.
- Boyes, A. D., & Fletcher, G. J. O. (2007). Metaperceptions of bias in intimate relationships. *Journal of Personality and Social Psychology*, 92, 286 - 306.
- Britton, B. K., & Tesser, A. (1991). Effects of time management practices on college grades. *Journal of Educational Psychology*, 83, 405 - 410.
- Brody, N. (1997). Intelligence, schooling, and society. *American Psychologist*, 52, 1046 - 1050.
- Burton, N. W., & Ramist, L. (2001). *Predicting Success in College: SAT Studies of Classes Graduating Since 1980*. New York: College Entrance Examination Board.
- Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (1999). The relation between learning styles, the Big Five personality traits and achievement motivation in higher education. *Personality and Individual Differences*, 26, 129 - 140.
- Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (2000). Intellectual ability, learning style, personality, achievement motivation and academic success of psychology students in higher education. *Personality and Individual Differences*, 29, 1057 - 1068.

- Cabrera, A., & La Nasa, S. (2000). Understanding the college-choice process. *New Directions for Institutional Research*, 107, 5 - 22.
- Carr, R., Wright, J. D., & Brody, C. J. (1996). Effects of high school work experience a decade later: Evidence from the National Longitudinal Study. *Sociology of Education*, 69, 66 - 81.
- Caspi, A., & Moffitt, T. E. (1993). When do individual differences matter? A paradoxical theory of personality coherence. *Psychological Inquiry*, 4, 247 - 271.
- Caspi, A., Roberts, B. R., & Shiner, R. L. (2005). Personality development: Stability and change. *Annual Review of Psychology*, 56, 453 - 484.
- Catsambis, S. (2001). Expanding knowledge of parental involvement in children's secondary education: Connections with high school seniors' academic success. *Social Psychology of Education*, 5, 149 - 177.
- Cattell, R. B. (1971). *Abilities: Their structure, growth, and action*. New York: Houghton Mifflin.
- Caygill, R., Marshall, N., & May, S. (2008a). *PISA 2006 Mathematical Literacy: How Ready are our 15-year-olds for Tomorrow's World?* Wellington: Ministry of Education.
- Caygill, R., Marshall, N., & May, S. (2008b). *PISA 2006 Reading Literacy: How Ready are our 15-year-olds for Tomorrow's World?* Wellington: Ministry of Education.
- Chamorro-Premuzic, T., & Furnham, A. (2003). Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality*, 37, 319 - 338.

- Chamorro-Premuzic, T., & Furnham, A. (2005). *Personality and Intellectual Competence*. Mahwah, NJ: Erlbaum.
- Chamorro-Premuzic, T., & Furnham, A. (2008). Personality, intelligence and approaches to learning as predictors of academic performance. *Personality and Individual Differences*, 44, 1596 - 1603.
- Chamorro-Premuzic, T., & Furnham, A. (2009). Mainly Openness: The relationship between the Big Five personality traits and learning approaches. *Learning and Individual Differences*, 19, 524 - 529.
- Chamorro-Premuzic, T., Quiroga, M. A., & Colom, R. (2009). Intellectual competence and academic performance: A Spanish study. *Learning and Individual Differences*, 19, 486 - 491.
- Chapple, S. (2000). *Māori Socio-Economic Disparity*. Wellington: Ministry of Social Policy, Department of Labour.
- Choat, D. (1998). *The Myth of Equal Opportunity: Wealth of School-District as a Determinant of Tertiary Participation*. Wellington: Aotearoa Polytechnic Student Union & New Zealand University Students' Association.
- Clark, R. (2002). In-school and out-of school factors that build student achievement: Research-based implications for school instructional policy. Retrieved April 15, 2010, from <http://www.ncrel.org/gap/clark/teacher.htm>
- Collier, V. P. (1987). Age and rate of acquisition of second language for academic purposes. *TESOL Quarterly*, 21, 617 - 641.
- Collier, V. P. (1989). How long? A synthesis of research on academic achievement in second language. *TESOL Quarterly*, 23, 509 - 531.

- Collier, V. P., & Thomas, W. P. (1989). How quickly can immigrants become proficient in school English? *Journal of Educational Issues of Language Minority Students*, 5, 26 - 38.
- Colom, R. (2007). Intelligence predicts scholastic achievement irrespective of SES factors: Evidence from Brazil. *Intelligence*, 35, 243 - 251.
- Connor, H., & Dewson, S. (2001). *Social class and higher education: Issues affecting decisions on participation by lower social class group* (Research Report 267). Norwich, UK: Department for Education and Employment.
- Costa, P. T., Jr., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology*, 38, 668 - 678.
- Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-factor Inventory (NEO-FFI): Professional Manual*. Odessa: Psychological Assessment Resources.
- Costa, P. T., Jr., & McCrae, R. R. (1994). Set like plaster: Evidence for the stability of adult personality. In T. F. Heatherton & J. L. Weinberger (Eds.), *Can Personality Change?* (pp. 21 - 40). Washington, DC: American Psychological Association.
- Crane, J. (1991). The epidemic theory of ghettos and neighborhood effects on dropping out and teenage childbearing. *American Journal of Sociology*, 96, 1226 - 1259.
- Crimm, J. A. (1992). *Parent Involvement and Academic Achievement: A meta-analysis*. Unpublished doctoral dissertation, University of Georgia, Georgia.

- Cummins, J. (1981). The role of primary language development in promoting educational success for language minority students. In C. F. Leyba (Ed.), *Schooling and Language Minority Students: A Theoretical Framework* (pp. 3 - 49). Sacramento, CA: California Department of Education.
- D'Amico, R. (1984). Does employment during high school impair academic progress? *Sociology of Education*, 57, 152 - 164.
- Davis, P., McLeod, K., Ransom, M., & Ongley, P. (1997). *The New Zealand Socioeconomic Index of Occupational Status: Research Report # 2*. Wellington: Statistics New Zealand.
- De Backer, C., Nelissen, M., Vyncke, P., Braeckman, J., & McAndrew, F. (2007). Celebrities: From teachers to friends. A test of two hypotheses on the adaptiveness of celebrity gossip. *Human Nature*, 18, 334 - 354.
- De Raad, B., & Schouwenburg, H. C. (1996). Personality in learning and education: A review. *European Journal of Personality*, 10, 303 - 336.
- Deary, I. J., Strand, S., Smith, P., & Fernandes, C. (2007). Intelligence and educational achievement. *Intelligence*, 35, 13 - 21.
- Deary, I. J., Whiteman, M. C., Starr, J. M., Whalley, L. J., & Fox, H. C. (2004). The impact of childhood intelligence on later life: Following up the Scottish mental surveys of 1932 and 1947. *Journal of Personality and Social Psychology*, 86, 130 - 147.
- DeSimone, J. S. (2008). *The impact of employment during school on college student academic performance* (NBER Working Papers 14006). Massachusetts: USA: National Bureau of Economic Research, Inc.
- Di Fabio, A., & Busoni, L. (2007). Fluid intelligence, personality traits and scholastic success: Empirical evidence in a sample of Italian high school

- students. *Journal of Personality and Individual Differences*, 43, 2095 - 2104.
- Digman, J. M. (1997). Higher-order factors of the Big Five. *Journal of Personality and Social Psychology*, 73, 1246 - 1256.
- Diseth, A. (2003). Personality and approaches to learning as predictors of academic achievement. *European Journal of Personality*, 17, 143 - 155.
- Dweck, C. S. (2008). Can personality be changed? The role of beliefs in personality and change. *Current Directions in Psychological Science*, 17, 391 - 394.
- Dweck, C. S., Chui, C.-y., & Hong, Y.-y. (1995). Implicit theories and their role in judgments and reactions: A word from two perspectives. *Psychological Inquiry*, 6, 267 - 285.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95, 256 - 273.
- Dweck, C. S., & Master, A. (2008). Self-theories motivate self-regulated learning. In D. H. Schunk & B. J. Zimmerman (Eds.), *Motivation and Self-Regulated Learning: Theories, Research and Applications*.
- Eagle, E. (1989). *Socioeconomic status, family structure, and parental involvement: The correlates of achievement*. Paper presented at the Annual meeting of the American Educational Research Association, San Francisco.
- Easterlin, R. A. (2001). Income and Happiness: Towards a Unified Theory. *Economic Journal of Adolescent research*, 111, 465 - 484.

- Eilam, B., Zeidner, M., & Aharon, I. (2009). Student conscientiousness, self-regulated learning, and science achievement: An explorative field study. *Psychology in the Schools, 46*, 420 - 432.
- Elliot, A. J., McGregor, H. A., & Gable, S. (1999). Achievement goals, study strategies, and exam performance: A mediational analysis. *Journal of Educational Psychology, 91*, 549 - 563.
- Engler, R. (2010). *Academic Performance of First-year Bachelors Students at University*. Wellington: Ministry of Education.
- Entwistle, N. (1988). Motivational factors in students' approaches to learning. In R. Schmeck (Ed.), *Learning Strategies and Learning Styles: Perspectives on Individual Differences* (pp. 21 - 51). New York: Plenum Press.
- Epstein, J. L. (1992). School and family partnerships. In M. Alkin (Ed.), *Encyclopedia of Educational Research* (pp. 1139 - 1151). New York: Macmillan.
- Evans, M. (1999). *School-leavers' transition to tertiary study: A literature review* (Working Paper 3/99). Melbourne, Australia: University of Monash, Department of Econometrics and Business Statistics.
- Eyal, K., & Cohen, J. (2006). When good friends say goodbye: A parasocial breakup study. *Journal of Broadcasting & Electronic Media, 50*, 502 - 523.
- Fan, X., & Chen, M. (2001). Parental involvement and students' academic achievement: A meta-analysis. *Educational Psychology Review, 13*, 1 - 22.
- Farsides, T., & Woodfield, R. (2003). Individual differences and undergraduate academic success: The roles of personality, intelligence, and application. *Personality and Individual Differences, 34*, 1225 - 1243.

- Ford, D. Y. (1992a). The American achievement ideology as perceived by urban African-American students: Explorations by gender and academic program. *Urban Education*, 27, 196 - 211.
- Ford, D. Y. (1992b). Self-perceptions of underachievement and support for the achievement ideology among early adolescent African-Americans. *Journal of Early Adolescence*, 12, 228 - 252.
- Friedman, L. (1989). Mathematics and the gender gap: A meta-analysis of recent studies on sex differences in mathematical tasks. *Review of Educational Research*, 59, 185 - 213.
- Frost, L. A., Hyde, J. S., & Fennema, E. (1994). Gender, mathematics performance, and mathematics-related attitudes and affect: A meta-analytic synthesis. *International Journal of Educational Research*, 21, 373 - 385.
- Funder, D. C. (2001). Personality. *Annual Review of Psychology*, 52, 197 - 221.
- Furnham, A., & Mitchell, J. (1991). Personality, needs, social skills and academic achievement: A longitudinal study. *Personality and Individual Differences*, 12, 1067 - 1073.
- Furnham, A., Mosen, J., & Ahmetoglu, G. (2009). Typical intellectual engagement, Big Five personality traits, approaches to learning and cognitive ability predictors of academic performance. *British Journal of Educational Psychology*, 79, 769 - 782.
- Gilles, P.-Y., & Bailleux, C. (2001). Personality traits and abilities as predictors of academic achievement. *European Journal of Psychology of Education*, 16, 3 - 15.

- Goldberg, L. R. (1990). An alternative 'description of personality': the Big-Five factor structure. *Journal of Personality and Social Psychology*, 59, 1216 - 1229.
- Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., et al. (2006). The International Personality Item Pool and the future of public-domain personality measures. *Journal of Research in Personality*, 40, 84 - 96.
- Guidubaldi, J., & Duckworth, J. (2009). Divorce and children's cognitive ability. In E. L. Grigorenko & R. J. Sternberg (Eds.), *Family Environment and Intellectual Function: A Life-span Perspective* (pp. 93 - 113). New Jersey, United States: Lawrence Erlbaum Associates, Inc.
- Hair, J. F., Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis with Readings* (5th ed.). Englewood Cliffs, New Jersey: Prentice-Hall.
- Hakuta, K., Butler, Y. G., & Witt, D. (2000). *How Long Does It Take English Learners to Attain Proficiency?* (Policy Report 2000-1). University of California Berkeley: Linguistic Minority Research Institute.
- Hanushek, E. A., Kain, J. F., Markman, J. M., & Rivkin, S. G. (2003). Does peer ability affect student achievement? *Journal of Applied Econometrics*, 18, 527 - 544.
- Harackiewicz, J. M., & Elliot, A. J. (1995). Life is a roller coaster when you view the world through entity glasses. *Psychological Inquiry*, 6, 298 - 301.
- Harker, D., Slade, P., & Harker, M. (2001). Exploring the decision process of 'school leavers' and 'mature students' in university choice. *Journal of Marketing for Higher Education*, 11, 1 - 20.

- Hattie, J. A. C. (1987). Identifying the salient facets of a model of student learning: A synthesis of meta-analyses. *International Journal of Educational Research*, 11, 187 - 212.
- Hattie, J. A. C. (1992). Measuring the effects of schooling. *Australian Journal of Education*, 36, 5 - 13.
- Hattie, J. A. C. (2009). *Visible Learning: A Synthesis of Meta-Analyses Relating to Achievement*. London and New York: Routledge.
- Hattie, J. A. C. (2010). *Boys' achievement: Rethinking the question*. Paper presented at the Association of Boys' Schools of New Zealand Conference, Wellington.
- Hattie, J. A. C., Biggs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research*, 66, 99 - 136.
- Haultain, S. A. (2009). *Deciding to Enter Tertiary Education and Taking on Debt: A Longitudinal Perspective*. Unpublished doctoral dissertation, University of Canterbury, Christchurch.
- Hedges, L. V., & Nowell, A. (1995). Sex differences in mental test scores, variability, and numbers of high-scoring individuals. *Science*, 269, 41 - 45.
- Henderson, V. L., & Dweck, C. S. (1990). Achievement and motivation in adolescence: A new model and data. In S. Feldman & G. Elliot (Eds.), *At the Threshold: The Developing Adolescent* (pp. 308 – 329). Cambridge, MA: Harvard University Press.
- Hill, L. (1990). Effort and reward in college: A replication of some puzzling findings. *Journal of Social Behavior and Personality*, 5, 151 - 161.

- Hillman, K. (2005). *The first year experience: The transition from secondary school to university and TAFE in Australia* (Longitudinal Studies of Australian Youth: Research Report 40). Camberwell, Victoria: The Australian Council for Educational Research Ltd.
- Hirsh, J. B., & Peterson, J. B. (2008). Predicting creativity and academic success with a 'Fake-Proof' measure of the Big Five. *Journal of Research in Personality*, 42, 1323 – 1333.
- Hong, S., & Ho, H.-Z. (2005). Direct and indirect longitudinal effects of parental involvement on student achievement: Second-order latent growth modelling across ethnic groups. *Journal of Educational Psychology*, 97, 32 - 42.
- Horton, D., & Wohl, R. R. (1956). Mass communication and para-social interaction: Observations on intimacy at a distance. *Psychiatry*, 19, 215 - 229.
- Hough, L. M. (1992). The 'Big Five' personality variables - Construct confusion: Description versus prediction. *Human Performance*, 5, 139 - 155.
- Huebner, E. S. (1991). Correlates of life satisfaction in children. *School Psychology Quarterly*, 6, 103 - 111.
- Huebner, E. S. (1994). Preliminary development and validation of a multidimensional life satisfaction scale for children. *Psychological Assessment*, 6, 149 - 158.
- Huebner, E. S. (2001). *Manual for the Multidimensional Students' Life Satisfaction Scale*. Columbia: University of South Carolina.

- Huebner, E. S., Ash, C., & Laughlin, J. E. (2001). Life experiences, locus of control and school satisfaction in adolescence. *Social Indicators Research*, 55, 167 - 183.
- Huebner, E. S., & Gilman, R. (2006). Students who like and dislike school. *Applied Research in Quality of Life*, 1, 139 - 150.
- Huebner, E. S., Laughlin, J. E., Ash, C., & Gilman, R. (1998). Further validation of the Multidimensional Students' Life Satisfaction Scale. *Journal of Psychoeducational Assessment*, 16, 118 - 134.
- Hyde, J. S. (1981). How large are cognitive gender differences? *American Psychologist*, 36, 892 - 901.
- Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist*, 60, 581 - 592.
- Hyde, J. S., & Linn, M. C. (1988). Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin*, 104, 53 - 69.
- International Personality Item Pool. (1996). Retrieved June 6, 2010, from <http://ipip.ori.org>
- James, R. (1999). *Non-traditional students and their university participation: An Australian perspective on persistent inequities and the new ideology of 'student choice'*. Paper presented at the 21st European Association of Institutional Research, Lund University, Sweden.
- James, R. (2001). Participation disadvantage in Australian higher education: An analysis of some effects of geographical location and socioeconomic status. *Higher Education*, 42, 455 - 472.
- James, W. (1950). *The Principles of Psychology*. New York: Dover.

- Jeynes, W. H. (2007). The relationship between parental involvement and urban secondary school student academic achievement: A meta-analysis. *Urban Education, 42*(1), 82 - 110.
- Jochems, W., Snippe, J., Smid, H. J., & Verweij, A. (1996). The academic progress of foreign students: Study achievement and study behaviour. *Higher Education, 31*, 325 - 340.
- Kanazawa, S. (2002). Bowling with our imaginary friends. *Evolution and Human Behavior, 23*, 167 - 171.
- Karatzias, A., Power, K. G., Flemming, J., Lennan, F., & Swanson, V. (2002). The role of demographics, personality variables and school stress on predicting school satisfaction/dissatisfaction: Review of the literature and research findings. *Educational Psychology, 22*, 33 - 50.
- Knutson, B., Wolkowitz, O. M., Cole, S. W., Chan, T., Moore, E. A., Johnson, R. C., et al. (1998). Selective alteration of personality and social behavior by serotonergic intervention. *American Journal of Psychiatry, 155*, 373 - 379.
- Kolb, D. A. (1984). *Experiential Learning*. Englewood Cliffs, NJ: Prentice Hall.
- Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: Can one construct predict them all? *Journal of Personality and Social Psychology, 86*, 148 - 161.
- Kunz, J. (1995). The impact of divorce on children's intellectual functioning: A meta-analysis. *Family Perspective, 29*, 75 - 101.
- Laidra, K., Pullmann, H., & Allik, J. (2007). Personality and intelligence as predictors of academic achievement: A cross-sectional study from elementary to secondary school. *Personality and Individual Differences, 42*, 441 - 451.

- Lavery, L. (2008). *Self-regulated Learning for Academic Success: An Evaluation of Instructional Techniques*. Unpublished doctoral dissertation, University of Auckland, Auckland.
- Leach, L., & Zepke, N. (2005). *Student Decision-Making by Prospective Tertiary Students: A Review of Existing New Zealand and Overseas Literature*. Wellington: Ministry of Education.
- Lerner, M. J. (1971). Observer's evaluation of a victim: Justice, guilt, and veridical perception. *Journal of Personality and Social Psychology*, 20, 127 - 135.
- Looker, E. D. (2001). *Why Don't They Go On? Factors Affecting the Decisions of Canadian Youth Not to Pursue Post-Secondary Education*. Quebec, Canada: Canada Millennium Scholarship Foundation Research Series.
- Looker, E. D., & Lowe, G. S. (2001). *Post-Secondary Access and Student Financial Aid in Canada: Current Knowledge and Research Gaps*. Quebec, Canada: Canadian Policy Research Network.
- Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin*, 131, 803 - 855.
- Maani, S. A. (2000). *School leaving, labour supply and tertiary education choices of young adults: An economic analysis utilising the 1977 - 1995 Christchurch Health and Development Surveys* (Treasury Working Paper 00/3). Wellington: Treasury Department.
- Maloney, T. (2004). *The Effects of In-school and In-tertiary Employment on Academic Achievement and Labour Market Transitions: Evidence from the Christchurch Health and Development Study*. Wellington: Department of Labour.

- Mangels, J. A., Butterfield, B., Lamb, J., Good, C. D., & Dweck, C. S. (2006). Why do beliefs about intelligence influence learning success? A social-cognitive neuroscience model. *Social, Cognitive and Affective Neuroscience, 1*, 75 - 86.
- Manthei, R. J., & Gilmore, A. (2005). The effect of paid employment on university students' lives. *Education and Training, 47*, 202 - 215.
- Maqsdud, M. (1993). Relationships of some personality variables to academic attainment of secondary school pupils. *Educational Psychology, 13*, 11 - 18.
- Marchioro, G., Azzarello, G., Checchin, F., Perale, M., Segati, R., Sampognaro, E., et al. (1996). The impact of a psychological intervention on quality of life in non-metastatic breast cancer. *European Journal of Cancer, 32*, 1612 - 1615.
- Marie, D., Fergusson, D. M., & Boden, J. M. (2008). Educational achievement in Māori: The roles of cultural identity and social disadvantage. *Australian Journal of Education, 52*, 183 - 196.
- Marsh, H. W. (1991). Employment during high school: Character building or subversion of academic goals? *Sociology of Education, 64*, 172 - 189.
- McCrae, R. R., & Costa, P. T., Jr. (1999). A five-factor theory of personality. In L. A. Pervin & O. P. John (Eds.), *Handbook of Personality: Theory and Research* (2nd ed., pp. 139 - 153). New York: Guilford Press.
- McCrae, R. R., Costa, P. T., Jr., Terracciano, A., Parker, W. D., Mills, C. J., De Fruyt, F., et al. (2002). Personality trait development from age 12 to age 18: Longitudinal, cross-sectional, and cross-cultural analyses. *Journal of Personality and Social Psychology, 83*(6), 1456 - 1468.

- McCrae, R. R., Costa, P. T., Ostendorf, F., Angleitner, A., Hrebickova, M., Avia, M. D., et al. (2000). Nature over nurture: Temperament, personality, and life span development. *Journal of Personality and Social Psychology*, 78(1), 173 - 186.
- McKenzie, K., Gow, K., & Schweitzer, R. (2004). Exploring first-year academic achievement through structural equation modelling. *Higher Education Research and Development*, 23, 95 - 112.
- McKenzie, K., & Schweitzer, R. (2001). Who succeeds at university? Factors predicting academic performance in first year Australian university students. *Higher Education Research and Development*, 20, 21 - 33.
- McNaughton, S. (2002). *Meeting of Minds*. Wellington: Learning Media.
- McPeck, J. (1981). *Critical thinking and Education*. Oxford, UK: Martin Robertson.
- Mickelson, R. A. (1990). The attitude-achievement paradox among black adolescents. *Sociology of Education*, 63, 44 - 61.
- Ministry of Education. (2004a). *Focus on Māori Achievement in Reading Literacy Results from PISA 2000*. Wellington: Ministry of Education.
- Ministry of Education. (2004b). *Focus on Pasifika Achievement in Reading Literacy Results from PISA 2000*. Wellington: Ministry of Education.
- Ministry of Education. (2007a). *Boys' Achievement: A Synthesis of the Data*. Wellington: Ministry of Education.
- Ministry of Education. (2007b). *The New Zealand Curriculum*. Wellington: Learning Media Limited.

Ministry of Education. (2007c). *Tertiary Student Retention*. Wellington: Ministry of Education.

Ministry of Education. (2008a). *Ka Hikitia – Managing for Success: The Māori Education Strategy 2008-1012*. Wellington: Ministry of Education.

Ministry of Education. (2008b). *Retention of students in senior secondary school*. Wellington: Ministry of Education.

Ministry of Education. (2009a). *How the Decile is Calculated*. Retrieved June 19, 2010, from <http://www.minedu.govt.nz/NZEducation/EducationPolicies/Schools/SchoolOperations/Resourcing/OperationalFunding/Deciles/HowTheDecileIsCalculated.aspx>

Ministry of Education. (2009b). *Impact of Education on Income*. Wellington: Ministry of Education.

Ministry of Education. (2009c). *National Standards: Information for Schools*. Wellington: Ministry of Education.

Ministry of Education. (2009d). *Participation Rates in Tertiary Education*. Wellington: Ministry of Education.

Ministry of Education. (2009e). *School Leavers with a University Entrance Standard*. Wellington: Ministry of Education.

Ministry of Education. (2010a). *Impact of Education on Income*. Wellington: Ministry of Education.

Ministry of Education. (2010b). *Unemployment Rate by Highest Qualification*. Wellington: Ministry of Education.

- Ministry of Social Development. (2006). *New Zealand Living Standards 2004*.
Wellington: Ministry of Social Development.
- Moewaka Barnes, H. (2001). *Tu Tangata Evaluation: Literature Review*.
Auckland, New Zealand: Alcohol and Public Health Research Unit,
University of Auckland.
- Mortimer, J. T., Shanahan, M., & Ryu, S. (1993). The effects of adolescent
employment on school related orientation and behaviour. In R. K.
Silberstein & E. Todt (Eds.), *Adolescence in Context: The Interplay of
Family, School, Peers and Work in Adjustment* (pp. 304 - 326). New York:
Springer-Verlag.
- Murdock, T. B. (1999). The social context of risk: Status and motivational
predictors of alienation in middle school. *Journal of Educational
Psychology*, 91, 62 - 75.
- Murdock, T. B., Anderman, L. H., & Hodge, S. A. (2000). Middle-grade
predictors of students' motivation and behaviour in high school. *Journal of
Adolescent research*, 15, 327 - 351.
- Musgrave-Marquart, D., Bromley, S. P., & Dalley, M. B. (1997). Personality,
academic attribution, and substance use as predictors of academic
achievement in college students. *Journal of Social Behavior and
Personality*, 12, 501 - 511.
- Naderi, H., Abdullah, R., Hamid, T. A., & Sharir, J. (2008). Intelligence and
gender as predictors of academic achievement among undergraduate
students. *European Journal of Social Sciences*, 7, 199 - 2007.
- Nash, R. (2004). The explanation of social differences in reading attainment: An
inspection of the PIRLS New Zealand data. *Waikato Journal of Education*,
10, 283 - 297.

- Nechyba, T., McEwan, P., & Older-Aguilar, D. (1999). *The Impact of Family and Community Resources on Student Outcomes. Strategic Research Initiative Literature Review*. Wellington: Ministry of Education.
- New Zealand Qualifications Authority. (2006). *Review of English Level 3 Achievement Standards*. Wellington: New Zealand Qualifications Authority.
- New Zealand Qualifications Authority. (2010a). NCEA and other NQF Qualifications: Participation Based. Available from NZQA website, <http://www.nzqa.govt.nz/qualifications/ssq/statistics/provider-selected-report.do?reportID=1161649>
- New Zealand Qualifications Authority. (2010b, 13 April). Review of University Entrance 2010. Retrieved April 13, 2010, from <http://www.nzqa.govt.nz/ncea/for-students/ue/ue-review-tor.html>
- Noftle, E. E., & Robins, R. W. (2007). Personality predictors of academic outcomes: Big Five correlates of GPA and SAT scores. *Journal of Personality and Social Psychology*, 93, 116 - 130.
- O'Connor, M. C., & Paunonen, S. V. (2007). Big Five personality predictors of post-secondary academic performance. *Personality and Individual Differences*, 43, 97 - 990.
- OECD. (2006). *Education at a Glance: OECD indicators 2006*. Paris: OECD.
- OECD. (2009). *Education at a Glance: OECD indicators 2009*. Paris: OECD.
- Oettinger, G. G. (1999). Does high school employment affect high school academic performance? *Industrial and Labor Relations Review*, 53, 136 - 151.

- Pang, H. H. P. (2009). *Big Five Personality Traits and Parental Involvement: Contributing as Predictors of Academic Performance in High School and College*. Unpublished doctoral dissertation, Alliant International University, Fresno, California.
- Payne, J. (2003). *Choice at the end of compulsory schooling: A research review* (Research Report No 414). Nottingham: Department for Education and Skills.
- Phillips, P., Abraham, C., & Bond, R. (2003). Personality, cognition, and university students' examination performance. *European Journal of Personality, 17*, 435 - 448.
- Pintrich, P. R., & DeGroot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*, 33 - 40.
- Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A Manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)* (Technical Report No. 91-B-004). Michigan: University of Michigan.
- Pong, S.-L., Dronkers, J., & Hampden-Thompson, G. (2003). Family policies and children's school achievement in single versus two-parent families. *Journal of Marriage and Family, 65*, 681 - 699.
- Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin, 135*, 322 - 338.
- Pullmann, H., Raudsepp, L., & Allik, J. (2006). Stability and change in adolescents' personality: A longitudinal study. *European Journal of Personality, 20*, 447 - 459.

- Purdie, N., & Hattie, J. A. C. (1999). The relationship between study skills and learning outcomes: A meta-analysis. *Australian Journal of Education*, 43, 72 - 86.
- Ramist, L. (Ed.). (1984). *Validity of the ATP tests*. New York: College Board.
- Reifman, A., Villa, L. C., Amans, J. A., Rethinam, V., & Telesca, T. Y. (2001). Children of divorce in the 1990s: A meta-analysis. *Journal of Divorce and Remarriage*, 36, 27 - 36.
- Rindermann, H., & Neubauer, A. C. (2001). The influence of personality on three aspects of cognitive performance: processing speed, intelligence and school performance. *Personality and Individual Differences*, 30, 829 - 842.
- Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, 130, 261 - 288.
- Roberts, B. W. (1997). Plaster or plasticity: Are work experiences associated with personality change in women? *Journal of Personality*, 65, 205 - 232.
- Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin*, 126, 3 - 25.
- Roberts, B. W., Wood, D., & Smith, J. L. (2005). Evaluating Five Factor Theory and social investment perspectives on personality trait development. *Journal of Research in Personality*, 39, 166 - 184.
- Robins, R. W., Fraley, R. C., Roberts, B. W., & Trzesniewski, K. H. (2001). A longitudinal study of personality change in young adulthood. *Journal of Personality*, 69, 617 - 640.

- Robins, R. W., Nofhle, E. E., Trzesniewski, K. H., & Roberts, B. W. (2005). Do people know their personality has changed? Correlates of perceived and actual personality change in young adulthood. *Journal of Personality*, 73, 489 - 522.
- Robins, R. W., & Pals, J. L. (2002). Implicit self-theories in the academic domain: Implications for goal orientation, attributions, affect, and self-esteem change. *Self and Identity*, 1, 313 - 336.
- Robinson, L. (1999). *The Effects of Part-time Work on School Students*. Camberwell, Victoria: The Australian Council for Educational Research Ltd.
- Rosenzweig, C. (2001). *A meta-analysis of parenting and school success: The role of parents in promoting students' academic achievement*. Paper presented at the Annual Meeting of the American Educational Research Association, Seattle, Washington.
- Rusting, C. L., & Larsen, R. J. (1997). Extraversion, neuroticism, and susceptibility to positive and negative affect: A test of two theoretical models. *Personality and Individual Differences*, 22, 607 - 612.
- Sá, W. C., Stanovich, K. E., & West, R. F. (1999). The domain specificity and generality of belief bias: Searching for generalizable critical thinking skill. *Journal of Educational Psychology*, 91, 497 - 510.
- Sammons, P. (1995). Gender ethnic and socio-economic differences in attainment and progress: A longitudinal analysis of student achievement over 9 years. *British Educational Research Journal*, 21(4), 465 - 485.
- Sanchez-Marin, M., Rejano-Infante, E., & Rodriguez-Troyano, Y. (2001). Personality and academic productivity in the university student. *Social Behavior and Personality*, 29, 299 - 305.

- Satherley, P. (2006). *Student Outcome Overview 2001-2005*. Wellington: Ministry of Education.
- Scharfe, E., & Bartholomew, K. (1998). Do you remember? Recollections of adult attachment patterns. *Personal Relationships*, 5(2), 219 - 234.
- Schuler, H., Funke, U., & Baron-Boldt, J. (1990). Predictive validity of school grades: A meta-analysis. *Applied Psychology: An International Review*, 39(1), 89 - 103.
- Schunk, D. H. (1995). Implicit theories and achievement behaviour. *Psychological Inquiry*, 6(4), 311 - 314.
- Scott, D. (2008). *How Does Achievement at School Affect Achievement in Tertiary Education?* Wellington: Ministry of Education.
- Scott, D., & Smart, W. (2005). *What Factors Make a Difference to Getting a Degree in New Zealand?* Wellington: Ministry of Education.
- Siegel, H. (1988). *Educating Reason: Rationality, Critical Thinking, and Education*. New York: Routledge.
- Sirin, S. R. (2005). Socio-economic status and academic achievement: A meta-analytic review of research. *Journal of Educational Research*, 75, 417 - 453.
- Slavin, R. E. (1995). *Research on Cooperative Learning and Achievement: What We Know, What We Need to Know*. Baltimore: Center for Research on the Education of Students Placed at Risk, Johns Hopkins University.
- Slavin, R. E. (1997). When does cooperative learning increase student achievement? In E. Dubinsky, D. Mathews & B. E. Reynolds (Eds.),

- Readings in Cooperative Learning for Undergraduate Mathematics* (pp. 71 - 84). Washington, DC: The Mathematical Association of America.
- Smith, G. (2002). Are there domain-specific thinking skills? *Journal of Philosophy of Education and Training*, 36, 207 - 227.
- Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology*, 84, 1041 - 1053.
- Statistics New Zealand. (1991 - 2008). *Household Labour Force Survey (June Quarter)*. Wellington: Statistics New Zealand.
- Statistics New Zealand. (1997 - 2008). *New Zealand Income Survey (June Quarter)*. Wellington: Statistics New Zealand.
- Steinberg, L., & Dornbusch, S. M. (1991). Negative correlates of part-time employment during adolescence: Replication and elaboration. *Developmental Psychology*, 27, 304 - 313.
- Steinmayr, R., Zieglerb, M., & Träublea, B. (2010). Do intelligence and sustained attention interact in predicting academic achievement? *Learning and Individual Differences*, 20, 14 - 18.
- Strenze, T. (2007). Intelligence and socioeconomic success: A meta-analytic review of longitudinal research. *Intelligence*, 35, 401 - 426.
- Studylink. (2010). Testing parents' income for the Student Allowance. Retrieved May 23, 2010, from <http://www.studylink.govt.nz/financing-study/student-allowance/testing-parent-income-for-student-allowance.html>
- Taafe, M., & Cunningham, E. G. (2005). *Measurement models of factors influencing academic achievement and completion of tertiary studies*.

Paper presented at the Annual Conference of Australian Association for Research in Education, Parramatta, Australia.

The IQ Test. (1999). Retrieved June 22, 2008, from www.allthetests.com/tests/iq-test.php3

Trapmann, S., Hell, B., Hirn, J.-O. W., & Schuler, H. (2007). Meta-analysis of the relationship between the Big Five and academic success at university. *Journal of Psychology*, 215, 132 - 151.

Trapmann, S., Hell, B., Weigand, S., & Schuler, H. (2007). Die Validität von Schulnoten zur Vorhersage des Studienerfolgs – eine Metaanalyse [The validity of high-school grades for academic achievement – A meta-analysis]. *Zeitschrift für Pädagogische Psychologie*, 21, 11 - 27.

Trueman, M., & Hartley, J. (1996). A comparison between the time-management skills and academic performance of mature and traditional-entry university students. *Higher Education*, 32, 199 - 215.

University of Auckland. (2010). *Faculty of Medical and Health Sciences Undergraduate Prospectus*. Auckland: University of Auckland.

University of Canterbury. (2010). Glossary of Terms. Retrieved May 19, 2010, from <http://www.canterbury.ac.nz/courses/glossary.shtml#g>

Ussher, S. (2008). *Post-school Choices: How Well Does Academic Achievement Predict the Tertiary Education Choices of School Leavers?* Wellington: Ministry of Education.

Vaidya, J. G., Gray, E. K., Haig, J., & Watson, D. (2002). On the temporal stability of personality: Evidence for differential stability and the role of life experiences. *Journal of Personality and Social Psychology*, 83, 1469 - 1484.

- Vickers, M., Lamb, S., & Hinkley, J. (2003). *Student workers in high school and beyond: The effects of part-time employment on participation in education, training and work* (LSAY Research Report No 30). Melbourne, Australia: The Australian Council for Educational Research Ltd.
- Viswesvaran, C., & Ones, D. S. (2000). Measurement error in 'Big Five Factors' personality assessment: Reliability generalization across studies and measures. *Educational and Psychological Measurement*, 60, 224 - 235.
- Vroom, V. H., & MacCrimmon, K. R. (1968). Toward a stochastic model of managerial careers. *Administrative Science Quarterly*, 13, 26 – 46.
- Wagerman, S. A., & Funder, D. C. (2007). Acquaintance reports of personality and academic achievement: A case for conscientiousness. *Journal of Research in Personality*, 41, 221 - 229.
- Wang, H., Harkess, C., & Parkin, M. (2007). Maori Senior Secondary Students' Achievement 2004 - 2006 Fact Sheet. Wellington: Ministry of Education.
- Wechsler, D. (1997). *The Wechsler Adult Intelligence Scale III (WAIS-3)*. San Antonio: The Psychological Corporation.
- Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. In M. Wittrock (Ed.), *Handbook of Research on Teaching* (pp. 315 - 327). New York: Macmillan.
- White, K. R. (1982). The relation between socioeconomic status and academic achievement. *Psychological Bulletin*, 91, 461 - 481.
- Wylie, C. (2001). *Ten Years Old and Competent - The Fourth Stage of the Competent Children Project: A Summary of the Main Findings*. Wellington: New Zealand Council for Educational Research.

- Wylie, C., Thompson, J., & Lythe, C. (1999). *Competent Children at 8: Families, Early Education and Schools*. Wellington: New Zealand Council for Educational Research.
- Yeh, S. S. (2009). Shifting the bell curve: The benefits and costs of raising student achievement. *Evaluation and Program Planning*, 32, 74 - 82.
- Zhang, L. F. (2003). Does the big five predict learning approach? *Personality and Individual Differences*, 34, 1431 - 1446.

Questionnaire on factors influencing academic outcomes

PART ONE: ABOUT ME

1. My sex is: Male ☐
Female ☐

2. My ethnicity is:
Please select all that apply.

NZ European/Pākehā ☐
NZ Māori ☐
Pasifika ☐
Asian ☐
Other (Please specify below) ☐
.....

3. What is the occupation of the principal earner in your household?
.....

4. On average, how many hours a week do you spend in paid employment?
.....

5. What is the language most commonly spoken in your home?
.....

6. I usually live with:
Please tick all that apply.

My mother ☐
My father ☐
My step-mother ☐
My step-father ☐
My aunt/uncle ☐
My grandparent(s) ☐
My siblings(s) (brother/sister) ☐
My step-sibling(s) ☐
My half-sibling(s) ☐
Other related adults ☐
Other unrelated adults ☐
Other (Please specify below) ☐
.....

PART TWO: MY PERSONALITY AND OPINIONS

Rating your OWN personality, circle ONE number on each scale.

7. Introvert	1	2	3	4	5	6	7	Extravert
8. Irresponsible	1	2	3	4	5	6	7	Responsible
9. Silent	1	2	3	4	5	6	7	Talkative
10. Unimaginative	1	2	3	4	5	6	7	Imaginative
11. Unkind	1	2	3	4	5	6	7	Kind
12. Disorganized	1	2	3	4	5	6	7	Organized
13. Guilt-ridden	1	2	3	4	5	6	7	Guilt-free

14. Unassertive	1	2	3	4	5	6	7	Assertive
15. Unreflective	1	2	3	4	5	6	7	Reflective
16. Careless	1	2	3	4	5	6	7	Thorough
17. Rude	1	2	3	4	5	6	7	Polite
18. Tense	1	2	3	4	5	6	7	Relaxed
19. Uncooperative	1	2	3	4	5	6	7	Cooperative
20. Insecure	1	2	3	4	5	6	7	Secure
21. Un-intellectual	1	2	3	4	5	6	7	Intellectual

Circle ONE number on the scale that best expresses your opinion on each statement.

22. My intelligence is something about me that I can't change very much.

Disagree 1 2 3 4 5 Agree

23. I make simple charts, diagrams or tables to help me organise class material.

Disagree 1 2 3 4 5 Agree

24. I make a schedule of the activities I have to do on school days.

Disagree 1 2 3 4 5 Agree

25. When I study, I go over my class notes and make an outline of important concepts.

Disagree 1 2 3 4 5 Agree

26. I talk to my parents/guardians about my subject choices.

Disagree 1 2 3 4 5 Agree

27. If I get bad marks, I can still get a good job.

Disagree 1 2 3 4 5 Agree

28. I work hard to do well in class even if I don't like what we are doing.

Disagree 1 2 3 4 5 Agree

29. I often find myself questioning things I hear or read in class to decide if I find them convincing.

Disagree 1 2 3 4 5 Agree

30. If I work hard in school, I will get a better job than the kids who don't try hard.

Disagree 1 2 3 4 5 Agree

31. My parents/guardians ask me about what I've been doing at school.

Disagree 1 2 3 4 5 Agree

32. I plan each day before I start it.

Disagree 1 2 3 4 5 Agree

33. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.

Disagree 1 2 3 4 5 Agree

34. I feel so lazy or bored when I study that I quit before I finish what I planned to do.

Disagree 1 2 3 4 5 Agree

35. When I read or hear a conclusion in class, I think about possible alternatives.

Disagree 1 2 3 4 5 Agree

36. I try to work with other students from the class to complete assignments.

Disagree 1 2 3 4 5 Agree

37. School is interesting.

Disagree 1 2 3 4 5 Agree

38. I write a set of goals for myself each day.

Disagree 1 2 3 4 5 Agree

39. When studying, I often set aside time to discuss the course material with a group of students from the class.

Disagree 1 2 3 4 5 Agree

40. I don't think an education will guarantee that I get paid well.

Disagree 1 2 3 4 5 Agree

41. Many of the things we do in school seem useless to me.

Disagree 1 2 3 4 5 Agree

42. I talk to my parents/guardians about school activities or events.

Disagree 1 2 3 4 5 Agree

43. I know many people who have done well in life with little education.

Disagree 1 2 3 4 5 Agree

44. My parents/guardians offer to help me with my homework/assignments.

Disagree 1 2 3 4 5 Agree

45. If I try hard in school, it will pay off later with a well-paying job.

Disagree 1 2 3 4 5 Agree

46. When studying, I often try to explain the material to a classmate or friend.

- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
47. I make a list of the things I have to do each day.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
48. When class work is difficult, I give up or only study the easy parts.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
49. I treat class material as a starting point and try to develop my own ideas about it.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
50. I probably won't get fair job treatment no matter how well I do in school.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
51. I have a clear idea of what I want to accomplish during the next week.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
52. My parents/guardians know the name of my form teacher.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
53. I find myself doing things which interfere with my studying simply because I hate to say 'No' to people.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
54. When I study, I read my class notes and the course readings over and over again.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
55. I have a set of goals for the entire term.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
56. I can make good money without an education.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
57. I talk to my parents/guardians about planning my study/homework timetable.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
58. When I study, I pull together information from different sources, such as classes, readings and discussions.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
59. I can learn new things, but I can't really change my basic intelligence.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
60. My parents/guardians attend parent interview evenings at school.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

61. I spend time each day planning.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

62. When I study, I go through the readings and my class notes and try to find the most important ideas.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

63. I will make more money someday if I do well in school.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

64. My parents/guardians make sure they have enough money to buy education supplies.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

65. I believe that there is room for improvement in the way I manage my time.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

66. My parents/guardians think learning and education are important for my future.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

67. I make constructive use of my time.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

68. I make lists of important definitions for my classes and memorise the lists.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

69. I regularly review my class notes, even when I don't have a test coming up.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

70. I look forward to going to school.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

71. I try to apply ideas from class readings in other class activities such as discussions and group work.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

72. I set and keep priorities.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

73. I try to play around with ideas of my own related to what I am learning in this course.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

74. There is no point in me being at school.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

75. I have a certain amount of intelligence and I can't really do much to change it.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

76. There are many things about school that I don't like.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

77. Even when class materials are dull and uninteresting, I manage to keep working until I finish.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

78. My parents/guardians talk to me about my future career or study options.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

79. I am still working on a major assignment the night before it is due.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

80. When I study, I practise saying the material to myself over and over.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

81. I memorise key words to remind me of important concepts in class.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

82. My parents/guardians check on whether I have done my homework.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

83. I try to relate ideas in one subject to those in other subjects whenever possible.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

84. When reading for classes, I try to relate the material to what I already know.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

85. I feel bad at school.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

86. When I study, I write brief summaries of the main ideas from the readings and the concepts from the classes.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

87. I continue to carry out unprofitable routines or activities.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

88. I try to understand class material by making connections between the readings and the concepts from the classes.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

89. I learn a lot at school.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

90. My parents/guardians know which subjects I like and dislike.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

91. When I study, I outline the material to help me organise my thoughts.

Disagree	1	2	3	4	5	Agree
----------	---	---	---	---	---	-------

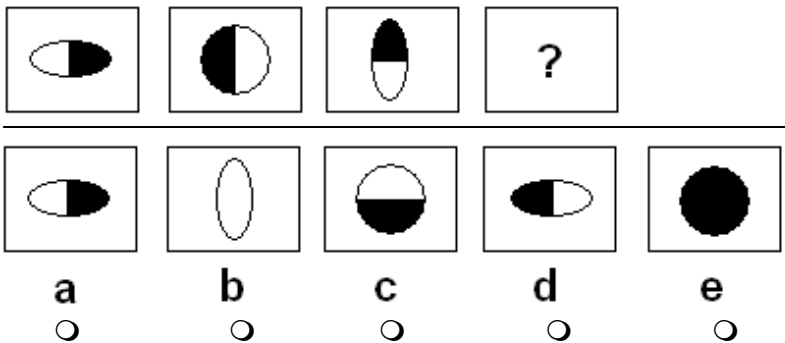
PART 3: MY INTELLECTUAL PROFILE

92. Write the next number in the sequence: 30, 29, 27, 26, 24, 23, 21, 20,

93. **Letter** is to **Word** as:

- ☐ a) club is to people
- ☐ b) homework is to school
- ☐ c) page is to book
- ☐ d) product is to factory
- ☐ e) picture is to crayon

94. Choose which figure comes next in the series:



95. Write the next number in the sequence: 3, 5, 8, 13, 21,

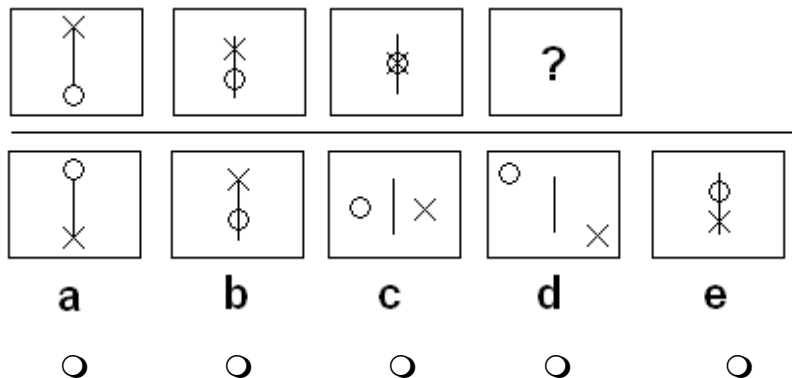
96. The day before the day before yesterday is three days after Saturday. What day is today?


- ☐ a) Sunday
- ☐ b) Monday
- ☐ c) Friday
- ☐ d) Thursday
- ☐ e) Saturday

97. Which word does not have a similar meaning to **energize**?

- ☐ a) rejuvenate
- ☐ b) strengthen
- ☐ c) enervate
- ☐ d) uplift
- ☐ e) invigorate


98. Choose which figure comes next in the series:



99. Write the next number in the sequence: 4, 5, 8, 17, 44, ,
100. Insert one letter to form two four-letter words: HUM ORK
101. Insert one letter to form two words: VEI ASER
102. Drinking and Driving causes many accidents. Choose the correct conclusion:
- ☐ a) People drink too much alcohol.
 - ☐ b) People should not drive when over the legal limit.
 - ☐ c) There is a 20 per cent chance of causing an accident by drunken driving.
 - ☐ d) Alcohol diminishes driving skills.
 - ☐ e) The police should carry out more breath tests.
103. **Wave** is to **crest** as:
- ☐ a) pinnacle is to nadir
 - ☐ b) mountain is to peak
 - ☐ c) sea is to ocean
 - ☐ d) breaker is to swimming
 - ☐ e) island is to archipelago
104. Choose which figure is the odd one out:
- 


a

☐



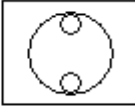
b

☐




c

☐



d

☐



e

☐
105. A trader buys tea for \$1200 and sells it for \$1500. Per sack of tea he makes a profit of \$50.
How many sacks of tea did he have?
106. 87 kg of potatoes are distributed in two boxes. One box weighs 11 kg less than the other one.
How many kilograms of potatoes does the lighter box contain?
107. What is the result of multiplying all figures from 0 to 25?
108. **Bouquet** is to **Flower** as:
- ☐ a) key is to door
 - ☐ b) air is to balloon
 - ☐ c) skin is to body
 - ☐ d) chain is to link
 - ☐ e) eye is to pigment
109. Write the next number in the sequence: 3, 4, 8, 17, 33, ,
110. Which lamp is the brightest?

Lamp A is less bright than Lamp B

Lamp B is brighter than Lamp C

Lamp C is as bright as Lamp D

Lamp B is brighter than Lamp D

Lamp D is brighter than Lamp A

☐ Lamp A ☐ Lamp B ☐ Lamp C ☐ Lamp D ☐ No solution

111. **Circle** is to **sphere** as:

☐ a) square is to triangle

☐ b) balloon is to airplane

☐ c) heaven is to hell

☐ d) wheel is to orange

☐ e) pill is to drop

112. Who is the shortest?

Oliver and Otto are the same height

Bert is shorter than Ben

Ben is taller than Otto

Oliver is shorter than Bert

☐ a) Oliver ☐ b) Otto ☐ c) Bert ☐ d) Ben ☐ e) none of the above

THANK YOU FOR PARTICIPATING IN THIS STUDY

A follow-up study with a similar format will be conducted next year. Participants in the follow-up study will have a chance to win some great prizes. If you consent to be contacted next year with some information about the study, please write your email address on the line below. Please note that consenting to be contacted does not mean that you are then obligated to take part in the study.

.....

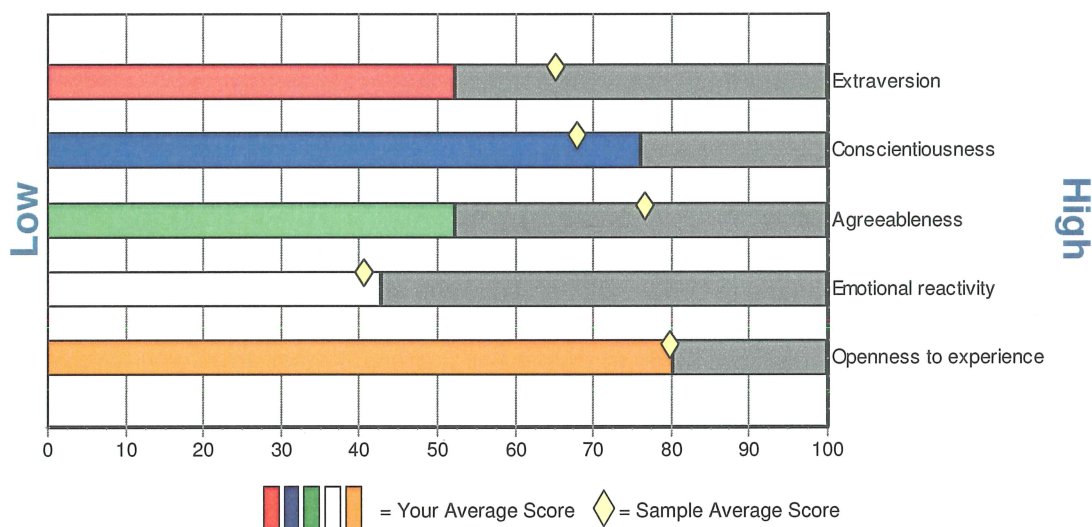
Jane Doe

Individual Profile

The information contained in this profile is based on the answers you gave when completing the 'Questionnaire on factors influencing academic outcomes'. It is important to note that many of the scales used were brief and only offer an indication of your personality or beliefs. These results are not intended to replace those you may have obtained from completing other, more detailed measures of personality, intelligence, or study and learning strategies.

Personality

The graph below shows your average scores on five facets of personality: Extraversion, Conscientiousness, Agreeableness, Emotional Reactivity and Openness to Experience. Your scores on these measures give an indication of how you tend to feel or behave. These scores do not mean that you will feel or act this way all the time or in all situations.



Extraversion

Extraversion is a measure of the extent to which a person enjoys engaging with the external world. You prefer a low level of external stimulation and so you need more time alone than some of your peers. You prefer to work alone rather than in groups, and you tend to feel frustrated when your results are dependent on the input of others. Others would probably describe you as reserved, independent and private. In a social situation, you prefer to listen to other people rather than share your own ideas and opinions. You prefer spending time with people you know to meeting new people.

Conscientiousness

Conscientiousness is the tendency to be consistently focussed on pursuing and achieving goals. You prefer a degree of structure and organisation, and you often make plans to help you organise your tasks. You like to set ambitious goals for yourself and you are willing to work hard to achieve them. Others would probably describe you as persistent and self-disciplined. You tend to pay attention to detail and you prefer to complete one project or task before moving onto the next one.

Agreeableness

Agreeableness is the tendency to pursue social harmony. You place more emphasis on your own

needs than those of other people. You would rather be seen as an individual than compromise your ideas or beliefs to fit in with the group. You tend to cope well in competitive or adversarial situations because you do not feel the need to alter your personality to fit in with others. Others would probably describe you as tough, stubborn and objective.

Emotional Reactivity

Emotional reactivity is the tendency to experience negative feelings and emotions. You sometimes react emotionally to situations and may become worried or upset. At other times you respond calmly to potentially stressful situations. You tend to experience negative emotions with a moderate degree of intensity and you usually find that you do not experience these negative emotions for a very long period of time. Others would probably describe you as somewhat sensitive and excitable.

Openness to Experience

Openness to Experience is the extent to which a person is open to new experiences and ideas. While you enjoy the familiar, you get bored doing the same thing all the time, so you also seek out new activities and experiences. You are open to considering new or innovative ways of doing things, although you like to be sure that the new method is better before you switch from a more traditional way of doing something. You like to come up with original solutions to problems or challenges, but you also give careful thought to whether the solution is practical or workable.

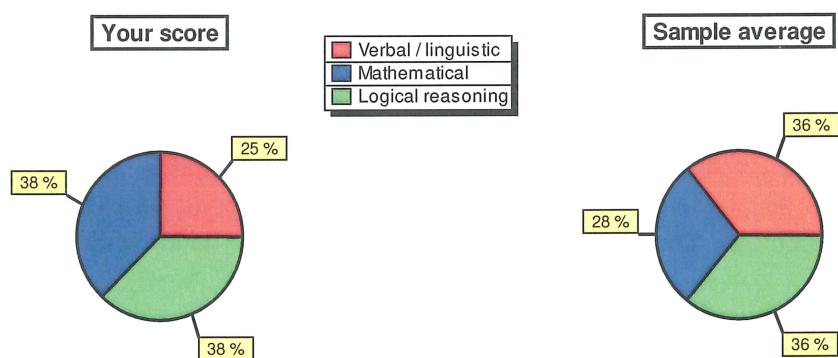
Intelligence

View of intelligence

Your responses indicate that you have a slight tendency to see intelligence as incremental rather than fixed. This means that you tend to believe that practice and effort have some impact on your level of intelligence and your ability to perform tasks. In some areas you tend to exert more effort following a failure so that you are more likely to succeed next time. In other areas, you invest less effort because you believe your natural ability in that area will not really be altered by practice.

Intelligence Profile

The graph below shows how three different types of intelligence make up your overall intelligence profile.



Your lowest score was on the verbal-linguistic scale, which is to do with written or spoken words. You sometimes have trouble expressing yourself, particularly in writing. You do not particularly enjoy reading, and you sometimes struggle to interpret the meaning of what you have read. You find subjects with an emphasis on reading and taking notes frustrating at times. To strengthen your verbal-linguistic intelligence, you could try using a dictionary to look up unfamiliar words. Try to find some reading material that you will enjoy outside of your required subject readings. Debating or discussing issues with your friends or family will strengthen your ability to communicate

persuasively.

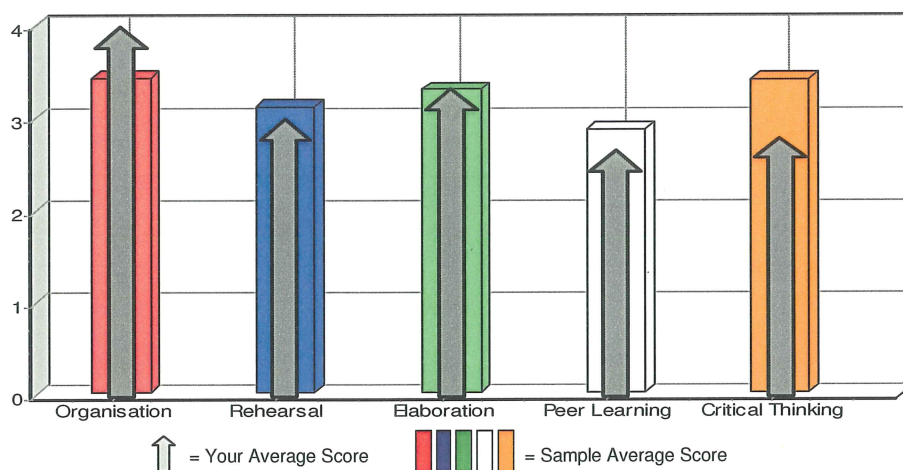
Your highest scores were on the logical reasoning scale, which is to do with abstract and deductive reasoning, and the mathematical scale, which is to do with numerical reasoning skills. You tend to be good at visualising and mentally manipulating objects, and you probably enjoy solving puzzles and riddles. You are good at thinking scientifically and logically to find solutions, and are skilled at deductive reasoning. You find that numerical patterns and equations often appear simple and obvious to you, even when others in your peer group have difficulty. You tend to be able to perform calculations quickly and with minimal or no written working. Careers which suit those with logical reasoning intelligence include detective, researcher and doctor. Careers which suit those with mathematical intelligence include scientist, mathematician and accountant.

Time Management

Time Management is the tendency to actively control and manage your use of time. It can be divided into long-term and short-term time management. You believe that both short and long-term time management are important, and you tend to actively manage both your short-term and long-term use of time to a certain degree. You sometimes plan your day or week in advance to make sure that you can fit in the tasks that you need to complete. You give some thought to planning in advance to make sure that you arrive on time and have all the things you need with you. You also tend to set some goals and priorities over a longer time period. You try to plan your time carefully so that you can work towards your goals in smaller, more manageable steps. Once you have decided that something is a goal or priority, you try to be focussed on that goal and not to let yourself be distracted.

Study and Learning Strategies

The graph below shows your average score on five different study and learning strategies: Organisation, Rehearsal, Elaboration, Peer Learning and Critical Thinking.



Organisation

Organisation refers to strategies that are used to select appropriate information and structure it effectively. Of the learning strategies measured, you indicated that organisation was the strategy that you use most often. You tend to use organisation more than the average member of your peer group. This means that when you are working on projects or assignments, you tend to use

techniques such as grouping relevant information, making summaries and outlines, and selecting the main ideas from reading passages. These strategies help you to identify appropriate information, and the close degree of involvement required tends to mean that you get a clear understanding of the material.

Rehearsal

Rehearsal involves learning a list of items by reciting the items repeatedly. You tend to use rehearsal less than the average member of your peer group. When you need to learn a simple list of items, further use of rehearsal strategies will help you store the information in your working memory.

Elaboration

Elaboration refers to strategies that are used to build connections between disparate ideas or items. You tend to use elaboration more than the average member of your peer group. This means that you tend to use techniques such as paraphrasing, summarising and creating analogies to help you understand and learn new material. You tend to integrate information from a number of different sources, such as lectures, readings, notes and group discussion to supplement and extend your understanding.

Peer Learning

Peer learning is the extent to which a learner chooses to work with others. Of the learning strategies measured, you indicated that peer learning was the strategy that you use least often. You use peer learning less than the average member of your peer group. This means that you do not usually choose to work with peers to complete assignments or extend your understanding of course material. You may find that making time to discuss ideas or material with peers helps you to clarify your understanding.

Critical Thinking

Critical thinking is the degree to which independent thought is used to assess information and draw conclusions. You tend to use critical thought less than the average member of your peer group. This means that you do not usually apply previous knowledge to new situations. When you learn new ideas or concepts, you do not often think about whether the information is convincing. Thinking about whether there is good supporting evidence will help you extend your understanding of material.

If you wish to discuss any of your results, you can contact Gabrielle Wall at (03) 378 7779 or gjw45@student.canterbury.ac.nz.

INFORMATION SHEET

Study of the role of personality, demographic and other variables in academic outcomes for final year secondary students.

You are invited to participate in the above named study. The study aims to identify factors that influence students' academic outcomes in their final year of secondary school.

The study examines the relative influence of personality, time management, parental involvement, attitude to education, study strategies, demographic variables and IQ on academic outcomes. It is being carried out as a requirement for a PhD by Gabrielle Wall, who can be contacted at (03) 378 7779 if you wish to discuss any concerns you may have about participation in the project. Gabrielle is under the supervision of Professor Simon Kemp, who can be contacted at (03) 364 2968. This project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

If you are willing to be involved in the study we will give you a questionnaire for completion. You will also need to give your consent for me to access your Year 13 National Qualifications Framework results. The questionnaire will take approximately 30 minutes to complete. After results have been collected and analysed, you will be provided with a comprehensive profile of your individual results. This will include information about your personality, your profile in the different areas of intelligence, and your preferred study and time management strategies.

Your school will be provided with the aggregate results of students' responses, in addition to the overall results for all schools in the study. They will not be provided with your individual results, nor will they have access to your profile. You will be able to compare your results to the results of your school and the results of the overall study.

You have the right to withdraw from the project at any time, including withdrawal of any information provided up to the time of publication of the results. There will not be any consequences if you withdraw from the project or choose not to participate, and your school will not be informed which students withdraw or choose not to participate. The results of the project will be published with no personal identity details. You may be assured of the confidentiality of data gathered in this investigation, subject only to any legal requirement to the contrary.

With thanks,

Gabrielle Wall
Phone: (03) 378 7779
Email: gjw45@student.canterbury.ac.nz

CONSENT FORM

Study of the role of personality, demographic and other variables in academic outcomes for final year secondary students.

I have read and understood the description of the named project. I agree to participate as a subject in the project, and I consent to the publication of the results of the project with the understanding that anonymity of individuals will be preserved.

I consent to the researcher accessing my National Qualifications Framework results for Year 13, and supply my full name, birth-date and National Student Number (where known) for that purpose and so I can receive my individual profile on completion of the study.

I understand also that I may at any time withdraw from the project, including withdrawal of any information that I have provided up to the time of publication of the results. I acknowledge that there will not be any consequences to myself if I choose to withdraw from the project or withdraw information from the project.

I understand that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

Full Name (please print): _____

Birth-date: ____ / ____ / ____

National Student Number: _____

If you do not know your National Student Number, please leave the space blank

Signature: _____

Date: _____

Table 50

Correlations between Study 1 Variables (N = 539)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Decile (1)	1.00	.28**	-.16*	.03	-.04	.02	.09*	.03	-.01	-.11**	.01	.03	.16**	.27**	.24**	.28**	.06	-.06	.08	-.04	.28**	.35**	.27**
Occupation (2)		1.00	-.17**	.03	.01	.04	-.03	.03	-.03	.04	.03	.13**	.12**	.19**	.12**	.18**	.03	.06	.04	.08	.20**	.23**	.20**
Employment (3)			1.00	.13**	.01	.05	-.05	-.02	-.01	-.06	-.01	-.03	-.04	-.10*	-.05	-.08	-.10*	-.05	-.03	.00	-.14**	-.22**	-.17**
Extraversion (4)				1.00	.16**	.30**	-.32**	.34**	-.09*	.11**	-.07	.14**	.05	-.01	-.01	.01	.15**	.16**	.16**	.00	-.07	.00	-.03
Conscientiousness (5)					1.00	.50**	-.18**	.29**	-.08	.30**	.25**	.22**	-.05	-.01	-.02	-.03	.37**	.14**	.35**	.41**	.14**	.07	.07
Agreeableness (6)						1.00	-.32**	.37**	-.10*	.32**	.20**	.27**	.03	-.07	-.02	-.03	.23**	.07	.37**	.17**	-.01	-.01	-.03
Neuroticism (7)							1.00	-.22**	.07	-.21**	.09*	-.17**	.06	.02	.05	.05	-.10*	-.12**	-.11**	-.20**	.06	.09*	.11**
Openness (8)								1.00	-.16**	.14**	-.04	.12**	.14**	.13**	.14**	.17**	.21**	.38**	.22**	.19**	.09*	.27**	.21**
Theory of Intelligence (9)									1.00	-.14**	-.02	-.03	-.12**	-.06	-.11*	-.11*	-.07	-.11**	-.12**	-.18**	-.03	-.09*	-.02
View of School (10)										1.00	.29**	.33**	-.06	.02	.04	.00	.31**	.29**	.45**	.38**	.14**	.13**	.12**
Value of Education (11)											1.00	.09*	-.08	.06	.00	-.01	.17**	.02	.27**	.16**	.16**	.11*	.10*
Parental Involvement (12)												1.00	.05	.03	.06	.05	.27**	.18**	.37**	.16**	.13**	.11*	.11**
Verbal Intelligence (13)													1.00	.41**	.49**	.77**	-.14**	.05	-.04	-.05	.26**	.25**	.24**
Mathematical Intelligence														1.00	.54**	.84**	-.01	.14**	.03	.06	.39**	.43**	.43**
Critical Reasoning (15)															.54**	1.00	.80**	-.01	.15**	.05	.04	.32**	.37**
Total Intelligence (16)																	1.00	-.07	.14**	.01	.03	.41**	.43**
Time Management (17)																		1.00	.31**	.45**	.37**	.11*	.10*
Critical Thinking (18)																			1.00	.39**	.29**	.06	.23**
Strategic Skills (19)																				1.00	.36**	.17**	.14**
Self-regulation (20)																					1.00	.19**	.17**
Credits (21)																						1.00	.61**
Merit or Excellence (22)																							1.00
Level 3 attainment (23)																							

* $p < .05$, ** $p < .01$

Questionnaire on factors influencing academic outcomes

PART ONE: ABOUT ME

1. My sex is: Male ☐
Female ☐

2. My ethnicity is:
Please select all that apply.

NZ European/Pākehā ☐
NZ Māori ☐
Pasifika ☐
Asian ☐
Other (Please specify below) ☐

.....

3. What is the occupation of the principal earner in your household?

.....

4. On average, how many hours a week do you spend in paid employment?

.....

5. I usually live with:
Please tick all that apply.

My mother ☐
My father ☐
My step-mother ☐
My step-father ☐
My aunt/uncle ☐
My grandparent(s) ☐
My siblings(s) (brother/sister) ☐
My step-sibling(s) ☐
My half-sibling(s) ☐
Other related adults ☐
Other unrelated adults ☐
Other (Please specify below) ☐

.....

PART TWO: MY PERSONALITY AND OPINIONS

Rating your OWN personality, circle ONE number on each scale.

6. Shy	1	2	3	4	5	6	7	Outgoing
7. Irresponsible	1	2	3	4	5	6	7	Responsible
8. Silent	1	2	3	4	5	6	7	Talkative
9. Unkind	1	2	3	4	5	6	7	Kind
10. Disorganized	1	2	3	4	5	6	7	Organized
11. Guilt-ridden	1	2	3	4	5	6	7	Guilt-free
12. Unassertive	1	2	3	4	5	6	7	Assertive
13. Careless	1	2	3	4	5	6	7	Thorough
14. Rude	1	2	3	4	5	6	7	Polite
15. Tense	1	2	3	4	5	6	7	Relaxed
16. Uncooperative	1	2	3	4	5	6	7	Cooperative
17. Insecure	1	2	3	4	5	6	7	Secure

Circle ONE number on the scale that best expresses your opinion on each statement.

18. My intelligence is something about me that I can't change very much.

Disagree 1 2 3 4 5 Agree

19. I make a schedule of the activities I have to do on school days.

Disagree 1 2 3 4 5 Agree

20. I make simple charts, diagrams or tables to help me organise class material.

Disagree 1 2 3 4 5 Agree

21. I often find myself questioning things I hear or read in class to decide if I find them convincing.

Disagree 1 2 3 4 5 Agree

22. I plan each day before I start it.

Disagree 1 2 3 4 5 Agree

23. I believe in the importance of art.

Disagree 1 2 3 4 5 Agree

24. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.

Disagree 1 2 3 4 5 Agree

25. When I read or hear a conclusion in class, I think about possible alternatives.

Disagree 1 2 3 4 5 Agree

26. I try to work with other students from the class to complete assignments.

Disagree 1 2 3 4 5 Agree

27. I write a set of goals for myself each day.

Disagree 1 2 3 4 5 Agree

28. When studying, I often set aside time to discuss the course material with a group of students from the class.

Disagree 1 2 3 4 5 Agree

29. I have a vivid imagination.

Disagree 1 2 3 4 5 Agree

30. When studying, I often try to explain the material to a classmate or friend.

Disagree 1 2 3 4 5 Agree

31. I make a list of the things I have to do each day.

Disagree 1 2 3 4 5 Agree

32. I treat class material as a starting point and try to develop my own ideas about it.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
33. When I study, I read my class notes and the course readings over and over again.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
34. When I study, I pull together information from different sources, such as classes, readings and discussions.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
35. I can learn new things, but I can't really change my basic intelligence.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
36. I spend time each day planning.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
37. I carry conversations to a higher level.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
38. When I study, I go through the readings and my class notes and try to find the most important ideas.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
39. I make constructive use of my time.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
40. I make lists of important definitions for my classes and memorise the lists.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
41. I don't like art.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
42. I have a clear idea of what I want to accomplish during the next week.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
43. I try to apply ideas from class readings in other class activities such as discussions and group work.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
44. When class work is difficult, I give up or only study the easy parts.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|
45. I enjoy hearing new ideas.
- | | | | | | | |
|----------|---|---|---|---|---|-------|
| Disagree | 1 | 2 | 3 | 4 | 5 | Agree |
|----------|---|---|---|---|---|-------|

46. I try to play around with ideas of my own related to what I am learning in this course.
Disagree 1 2 3 4 5 Agree
47. I have a certain amount of intelligence and I can't really do much to change it.
Disagree 1 2 3 4 5 Agree
48. I am still working on a major assignment the night before it is due.
Disagree 1 2 3 4 5 Agree
49. When I study, I practise saying the material to myself over and over.
Disagree 1 2 3 4 5 Agree
50. I tend to avoid philosophical discussions.
Disagree 1 2 3 4 5 Agree
51. I memorise key words to remind me of important concepts in class.
Disagree 1 2 3 4 5 Agree
52. I try to relate ideas in one subject to those in other subjects whenever possible.
Disagree 1 2 3 4 5 Agree
53. I'm not interested in abstract ideas.
Disagree 1 2 3 4 5 Agree
54. When reading for classes, I try to relate the material to what I already know.
Disagree 1 2 3 4 5 Agree
55. When I study, I write brief summaries of the main ideas from the textbook readings and the concepts from the classes.
Disagree 1 2 3 4 5 Agree
56. I feel so lazy or bored when I study that I quit before I finish what I planned to do.
Disagree 1 2 3 4 5 Agree
57. I don't like visiting museums.
Disagree 1 2 3 4 5 Agree
58. I have a set of goals for the entire term.
Disagree 1 2 3 4 5 Agree
59. When I study, I outline the material to help me organise my thoughts.
Disagree 1 2 3 4 5 Agree

PART 3: MY INTELLECTUAL PROFILE

60. **Letter** is to **Word** as:

- ☐ a) club is to people
- ☐ b) homework is to school
- ☐ c) page is to book
- ☐ d) product is to factory
- ☐ e) picture is to crayon

61. Write the next number in the sequence: 3, 5, 8, 13, 21, ,

62. The day before the day before yesterday is three days after Saturday. What day is today?

- ☐ a) Sunday
- ☐ b) Monday
- ☐ c) Friday
- ☐ d) Thursday
- ☐ e) Saturday

63. Which word does not have a similar meaning to **energize**?

- ☐ a) rejuvenate
- ☐ b) strengthen
- ☐ c) enervate
- ☐ d) uplift
- ☐ e) invigorate

64. Write the next number in the sequence: 4, 5, 8, 17, 44, ,

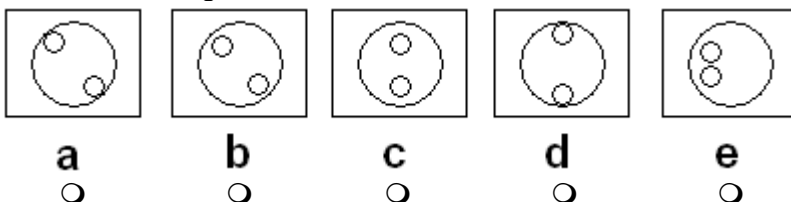
65. Drinking and Driving causes many accidents. Choose the correct conclusion:

- ☐ a) People drink too much alcohol.
- ☐ b) People should not drive when over the legal limit.
- ☐ c) There is a 20 per cent chance of causing an accident by drunken driving.
- ☐ d) Alcohol diminishes driving skills.
- ☐ e) The police should carry out more breath tests.

66. **Wave** is to **crest** as:

- ☐ a) pinnacle is to nadir
- ☐ b) mountain is to peak
- ☐ c) sea is to ocean
- ☐ d) breaker is to swimming
- ☐ e) island is to archipelago

67. Choose which figure is the odd one out:



68. A trader buys tea for \$1200 and sells it for \$1500. Per sack of tea he makes a profit of \$50.
How many sacks of tea did he have?
69. 87 kg of potatoes are distributed in two boxes. One box weighs 11 kg less than the other one.
How many kilograms of potatoes does the lighter box contain?
70. What is the result of multiplying all figures from 0 to 25?
71. **Bouquet** is to **Flower** as:
☐ a) key is to door
☐ b) air is to balloon
☐ c) skin is to body
☐ d) chain is to link
☐ e) eye is to pigment
72. Which lamp is the brightest?
Lamp A is less bright than Lamp B
Lamp B is brighter than Lamp C
Lamp C is as bright as Lamp D
Lamp B is brighter than Lamp D
Lamp D is brighter than Lamp A
☐ Lamp A ☐ Lamp B ☐ Lamp C ☐ Lamp D ☐ No solution
73. **Circle** is to **sphere** as:
☐ a) square is to triangle
☐ b) balloon is to airplane
☐ c) heaven is to hell
☐ d) wheel is to orange
☐ e) pill is to drop
74. Who is the shortest?
Oliver and Otto are the same height
Bert is shorter than Ben
Ben is taller than Otto
Oliver is shorter than Bert
☐ a) Oliver ☐ b) Otto ☐ c) Bert ☐ d) Ben ☐ e) None of the above

Appendix G

INFORMATION SHEET

Study of the role of personality, demographic and other variables in academic outcomes for final year secondary students.

You are invited to participate in the above named study. The study aims to identify factors that influence students' academic outcomes in their final year of secondary school.

The study examines the relative influence of personality, time management, parental involvement, attitude to education, study strategies, demographic variables and IQ on academic outcomes. It is being carried out as a requirement for a PhD by Gabrielle Wall, who can be contacted at (03) 378 7779 if you wish to discuss any concerns you may have about participation in the project. Gabrielle is under the supervision of Professor Simon Kemp, who can be contacted at (03) 364 2968. This project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

If you are willing to be involved in the study I will give you a questionnaire for completion. You will also need to give your consent for me to access your Year 13 National Qualifications Framework results. The questionnaire will take approximately 30 minutes to complete. Following this, you will be invited to take part in two study skills workshops that will be held during class time.

These workshops are designed to extend your understanding and use of study and learning strategies. At the first workshop, you will be provided with a comprehensive profile of your individual results on the questionnaire. This will include information about your personality, your profile in the different areas of intelligence, and your preferred study and time management strategies.

You will be asked to provide a contact cell phone number or email address. This will be used throughout the year to send you text or email reminders before upcoming assessments. These messages are designed to reinforce your use of the study and learning strategies covered in the workshops.

Your school will be provided with the aggregate results of students' responses. They will not be provided with your individual results, nor will they have access to your profile. You have the right to withdraw from the project at any time, including withdrawal of any information provided up to the time of publication of the results.

There will not be any consequences if you withdraw from the project or choose not to participate, and your school will not be informed which students withdraw or choose not to participate. The results of the project will be published with no personal identity details. You may be assured of the confidentiality of data gathered in this investigation, subject only to any legal requirement to the contrary.

With thanks,

Gabrielle Wall
Phone: (03) 378 7779
Email: gjw45@student.canterbury.ac.nz

Appendix H

CONSENT FORM

Study of the role of personality, demographic and other variables in academic outcomes for final year secondary students.

I have read and understood the description of the named project. I agree to participate as a subject in the project, and I consent to the publication of the results of the project with the understanding that anonymity of individuals will be preserved.

I consent to the researcher accessing my National Qualifications Framework results for Year 13, and supply my full name, birth-date and National Student Number (where known) for that purpose.

I agree to take part in the study skills workshops and I consent to the publication of comments or questions that I contribute during the workshops, with the understanding that my anonymity will be preserved.

I consent to the researcher contacting me during the year with text messages reminding me of the study and learning skills covered in the workshops, and supply my contact cell phone number (or email address) for that purpose.

I understand also that I may at any time withdraw from the project, including withdrawal of any information that I have provided up to the time of publication of the results. I acknowledge that there will not be any consequences to myself if I choose to withdraw from the project or withdraw information from the project.

I understand that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

Full Name (please print): _____

Birth-date: ____ / ____ / ____

National Student Number: _____

If you do not know your National Student Number, please leave the space blank

Cell Phone Number: _____

If you do not have a cell phone, please supply an email address for an account that you check regularly.

Signature: _____

Date: _____

Table 51

Correlations between Study 2 Variables (N = 151)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Occupation (1)	1.00	-.12	.04	-.03	-.13	.04	.14	-.02	.18*	.09	.09	.09	.11	.01	.19*	.05	.13	.19*	.24**	.23**
Employment (2)		1.00	.12	.12	-.03	-.05	-.03	-.04	.02	.02	.16*	-.02	.06	-.02	.03	-.08	-.02	.07	-.02	-.08
Extraversion (3)			1.00	.12	.10	-.36**	.23**	-.03	.00	.22**	.15	.06	.29**	.02	.00	-.07	-.02	-.09	.00	-.05
Conscientiousness (4)				1.00	.45**	-.36**	-.17*	-.16*	.43**	.03	.33**	-.10	.21*	.01	.16*	.04	.10	.30**	.14	.23**
Agreeableness (5)					1.00	.45**	1.00	-.44**	-.14	-.08	.09	-.05	.12	.03	.21**	-.18	-.06	-.13	-.09	-.11
Neuroticism (6)						1.00	.17*	.19*	.07	-.05	-.04	.04	-.20*	.10	.00	.10	.08	.11	.14	.19**
Openness (7)							1.00	-.19*	.11	.51**	.21*	.25**	.03	.21*	.01	.06	.10	.04	.25**	.14
Theory of Intelligence (8)								1.00	-.08	-.24**	-.26**	.01	.04	-.09	-.03	-.02	-.06	-.07	-.09	-.07
Time Management (9)									1.00	.24**	.51**	.08	.34**	.05	.07	-.02	.05	.30**	.29**	.32**
Critical Thinking (10)										.24**	.28**	.17*	.26**	.26**	.11	.08	.19**	.11	.26**	.17*
Strategic Skills (11)											.51**	.28**	.100	.03	.21*	.04	-.08	-.02	.21**	.23**
Self-regulation (12)												.17*	.03	1.00	.12	.07	.02	.08	-.06	-.04
Peer Learning (13)													.21*	1.00	.05	.11	.02	.09	.02	.04
Verbal Intelligence (14)													.05	.07	1.00	.32**	.36**	.71**	.25**	.31**
Mathematical Intelligence													.11	.32**	1.00	.35**	.81**	.21*	.29**	.22**
Critical Reasoning (16)													.02	.36**	.35**	1.00	.71**	.14	.23**	.18*
Total Intelligence (17)													.09	.71**	.81**	.71**	1.00	.27**	.37**	.30**
Credits (18)													.02	.25**	.21*	.14	.27**	1.00	.71**	.83**
Merit or Excellence (19)													-.02	.31**	.29**	.23**	.37**	.71**	1.00	.86**
Level 3 attainment (20)													-.04	.27**	.22**	.18*	.30**	.83**	.86**	1.00

* $p < .05$, ** $p < .01$

Appendix J

Dear [FirstName],

Study of the role of personality, demographic and other variables in academic outcomes for first year tertiary students

You are invited to participate in the above named project. This is a follow-up project to a study you completed in 2008 when you were a Year 13 student. Your involvement in the study will be completing a short questionnaire, which will take approximately **10 minutes** to complete. If you participate in the study, you will go in the draw to **win one of five cash prizes of \$50**.

To participate in the study, **click here**. Note that by clicking this link and completing the questionnaire you consent to participate in the above named project and you give consent for me to access your 2009 GPA from the University of Canterbury:

The final date by which you can complete the questionnaire is **Friday 6th November**.

You will have the right to withdraw from the project at any time, including withdrawal of any information provided up to the time of publication of the results. There will not be any consequences if you withdraw from the project or choose not to participate. The results of the project will be published, but you may be assured of the complete confidentiality of data gathered in this investigation.

The study examines the relative influence of personality, time management, attitude to education, study strategies and demographic variables on academic outcomes. It is being carried out as a requirement for a PhD by Gabrielle Wall, who can be contacted at (03) 378 7779 if you wish to discuss any concerns you may have about participation in the project. Gabrielle is under the supervision of Professor Simon Kemp, who can be contacted at (03) 364 2968. This project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

With thanks,
Gabrielle Wall
Phone: (03) 378 7779
Email: gabrielle.wall@minedu.govt.nz

1. About You

*** Name (first and last):**

On average, how many hours a week do you spend in paid employment?

I usually live with:

(Please select all that apply)

☐

My flatmates

☐

My boyfriend/girlfriend

☐

My mother

☐

My father

☐

My stepmother

☐

My stepfather

☐

My aunt/uncle

☐

My grandparent(s)

☐

My siblings (including step and half siblings)

Other (please specify)

2. Your Personality

For each personality trait, please click the option that best describes your personality.

Shy 1	2	3	4	5	6	Outgoing 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Irresponsible 1	2	3	4	5	6	Responsible 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Silent 1	2	3	4	5	6	Talkative 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unkind 1	2	3	4	5	6	Kind 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disorganised 1	2	3	4	5	6	Organised 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guilt-ridden 1	2	3	4	5	6	Guilt-free 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unassertive 1	2	3	4	5	6	Assertive 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Careless 1	2	3	4	5	6	Thorough 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rude 1	2	3	4	5	6	Polite 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tense 1	2	3	4	5	6	Relaxed 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uncooperative 1	2	3	4	5	6	Cooperative 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insecure 1	2	3	4	5	6	Secure 7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Your Opinions

Please select one answer for each statement that best expresses your opinion on that statement.

My intelligence is something about me that I can't change very much.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I make a schedule of the activities I have to do on weekdays.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I often find myself questioning things I hear or read in lectures to decide if I find them convincing.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I plan each day before I start it.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I believe in the importance of art.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When a theory, interpretation, or conclusion is presented in a lecture or in the readings, I try to decide if there is good supporting evidence.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I read or hear a conclusion in lectures, I think about possible alternatives.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I write a set of goals for myself each day.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I have a set of goals for the entire term.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I have a vivid imagination.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I make a list of the things I have to do each day.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I treat lecture material as a starting point and try to develop my own ideas about it.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I study, I read my lecture notes and the course readings over and over again.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I study, I pull together information from different sources, such as lectures, readings and discussions.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I can learn new things, but I can't really change my basic intelligence.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I spend time each day planning.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I carry conversations to a higher level.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I study, I go through the readings and my lecture notes and try to find the most important ideas.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I make constructive use of my time.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Your Opinions

Please select one answer for each statement that best expresses your opinion on that statement.

I make lists of important definitions for my courses and memorise the lists.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I don't like art.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I have a clear idea of what I want to accomplish during the next week.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I try to apply ideas from course readings in other course activities such as discussions and group work.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When classwork is difficult, I give up or only study the easy parts.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I enjoy hearing new ideas.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I try to play around with ideas of my own related to what I am learning in this course.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I have a certain amount of intelligence and I can't really do much to change it.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I am still working on a major assignment the night before it is due.

Disagree				Agree
1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I study, I practise saying the material to myself over and over.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I tend to avoid philosophical discussions.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I memorise key words to remind me of important concepts in class.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I try to relate ideas in one course to those in other courses whenever possible.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I'm not interested in abstract ideas.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When reading for lectures, I try to relate the material to what I already know.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I study, I write brief summaries of the main ideas from the readings and the concepts from the lectures.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I feel so lazy or bored when I study that I quit before I finish what I planned to do.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I don't like visiting museums.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I study, I outline the material to help me organise my thoughts.

Disagree	2	3	4	Agree
1				5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Consent

Please answer each of the items to indicate your consent to participate in this project and to indicate your consent for me to access your University of Canterbury GPA for 2009.

Giving consent to each of these items enables you to be entered in the draw for one of the cash prizes.

*** I have read and understood the description of the named project. I agree to participate as a subject in the project, and I consent to the publication of the results of the project with the understanding that anonymity of individuals will be preserved.**

☐

*** I understand that I may at any time withdraw from the project, including withdrawal of any information that I have provided up to the time of publication of the results.**

☐

*** I consent to the researcher accessing my University of Canterbury GPA for 2009.**

☐

Table 52

Correlations between Study 3 Variables (N = 57)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Decile (1)	1.00	.05	.10	.15	.05	-.02	.30*	.07	-.17	-.05	-.02	-.03	.01	.14	-.04	.06	.18	.06	.05	.02	.18	.29*	.18	.28*
Occupation (2)	.05	1.00	-.17	.33*	-.02	.16	-.10	-.04	.07	.12	-.21	.11	.36**	.27*	.34**	.39**	-.31*	-.06	.08	.00	.03	-.03	-.09	.09
Employment (3)	.10	-.17	1.00	-.01	-.02	.17	.30*	-.08	.06	-.02	.16	.11	.04	.02	-.05	.00	.19	-.09	-.02	-.20	.09	-.06	.00	.10
Extraversion (4)	.15	.33*	-.01	1.00	.18	.27*	.11	.08	-.01	.25	.12	-.03	-.03	-.06	-.05	-.06	.15	.21	.32*	.03	-.26	-.08	-.21	-.11
Conscientiousness (5)	.05	-.02	-.02	.18	1.00	.58**	-.11	.18	-.20	.18	.24*	.11	-.15	-.29*	-.14	-.26*	.39**	.10	.33*	.43**	.10	.09	.06	.18
Agreeableness (6)	-.02	.16	.17	.27*	.58**	1.00	-.02	.09	-.11	.33*	.13	.16	.00	-.17	-.09	-.12	.31*	.12	.18	.22	.08	-.04	.01	.17
Neuroticism (7)	.30*	-.10	.30*	-.11	-.12	-.02	1.00	.20	.09	-.10	.09	-.09	.01	.19	-.02	.11	.01	-.10	-.21	-.34*	.03	.21	.23	.16
Openness (8)	.07	-.04	-.08	.08	.18	.09	.20	1.00	-.08	.24	.11	.11	-.06	.18	.31*	.17	.20	.53**	.27*	-.23	.11	.29*	.31*	.15
Theory of Intelligence (9)	-.17	.07	.06	-.01	-.20	-.11	.09	-.08	1.00	-.07	-.35**	-.01	.03	-.08	-.06	-.05	-.14	.04	-.24	-.07	.11	-.01	.06	-.10
View of School (10)	-.05	.12	-.02	.25	.18	.33*	-.10	.24	-.07	1.00	.31*	.05	-.14	.04	.06	-.01	.23	.33*	.27*	.10	.14	.08	.12	.07
Value of Education (11)	-.02	-.21	.16	.12	.24	.13	.09	.11	-.35**	.31*	1.00	-.04	-.31*	-.11	-.26*	-.26	.28*	-.02	.24	.18	-.05	.04	.03	.15
Parental Involvement (12)	-.03	.11	.11	-.03	.11	.16	-.09	.11	-.01	.05	-.04	1.00	-.05	-.09	-.06	-.03	-.08	-.17	.19	.14	-.06	-.15	-.14	-.13
Verbal Intelligence (13)	.01	.36	.04	-.03	-.15	.00	.01	-.06	.03	-.14	-.31*	-.05	1.00	.50**	.50**	.80**	-.28*	-.13	-.10	-.22	.23	.11	.07	.17
Mathematical Intelligence	.14	.27	.02	-.06	-.29*	-.17	.19	.18	-.08	.04	-.11	-.09	.50**	1.00	.44**	.83**	-.15	.05	-.24	-.40**	.44**	.38**	.42**	.30*
Critical Reasoning (15)	-.04	.34	-.05	-.05	-.14	-.09	.02	.31*	-.06	.06	-.26*	-.06	.50**	.44**	1.00	.74**	-.22	.08	-.06	-.16	.11	.26*	.33*	.15
Total Intelligence (16)	.06	.39	.01	-.06	-.26	-.12	.11	.17	-.05	-.01	-.26	-.08	.80**	.86**	.74**	1.00	-.26	.01	-.19	-.34**	.36**	.33**	.36**	.28*
Time Management (17)	.18	-.31	.19	.15	.39**	.31*	.01	.20	-.14	.23	.28*	-.08	-.28*	-.15	-.22	-.26	1.00	.33*	.37**	.22	.03	-.03	-.03	.04
Critical Thinking (18)	.06	-.06	-.09	.21	.10	.12	-.10	.53**	.04	.33*	-.02	-.17	-.13	.05	.08	.01	.33*	1.00	.25	-.04	.03	.22	.20	-.10
Strategic Skills (19)	.05	.08	-.02	.32*	.33*	.18	-.21	.27*	-.24	.27	.24	.19	-.10	-.24	-.06	-.14	.37**	.25	1.00	.11	-.19	-.11	-.16	-.07
Self-regulation (20)	.02	.01	-.20	.03	.43**	.21	-.34*	-.23	-.07	.10	.18	.14	-.22	-.40**	-.16	-.34**	.22	-.04	.10	1.00	.01	-.04	-.09	.07
Credits (21)	.18	.03	.09	-.26	.10	.08	.03	.11	.11	.14	-.05	-.06	.23	.44**	.11	.36**	.03	.03	-.19	.00	1.00	.60**	.68**	.60**
Merit or Excellence (22)	.29*	-.03	-.06	-.08	.09	-.04	.21	.29*	-.01	.08	.04	-.15	.11	.38**	.26*	.33*	-.03	.22	-.11	-.04	.60**	1.00	.84**	.71**
Level 3 attainment (23)	.18	-.09	.00	-.21	.06	.01	.23	.31*	.06	.12	.03	-.14	.07	.42**	.33*	.36**	-.03	.20	-.16	-.09	.68**	.84**	1.00	.61**
GPA (24)	.28*	.09	.10	-.11	.18	.17	.16	.15	-.10	.07	.15	-.13	.17	.30*	.15	.28*	.04	-.10	-.07	.07	.60**	.71**	.61**	1.00

* $p < .05$, ** $p < .01$